

AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING

Civilian and Defense

SEPTEMBER 1, 1951

In This Issue . . .

Testing Automatic Transmissions

Improvements in Two-Stroke Blowers

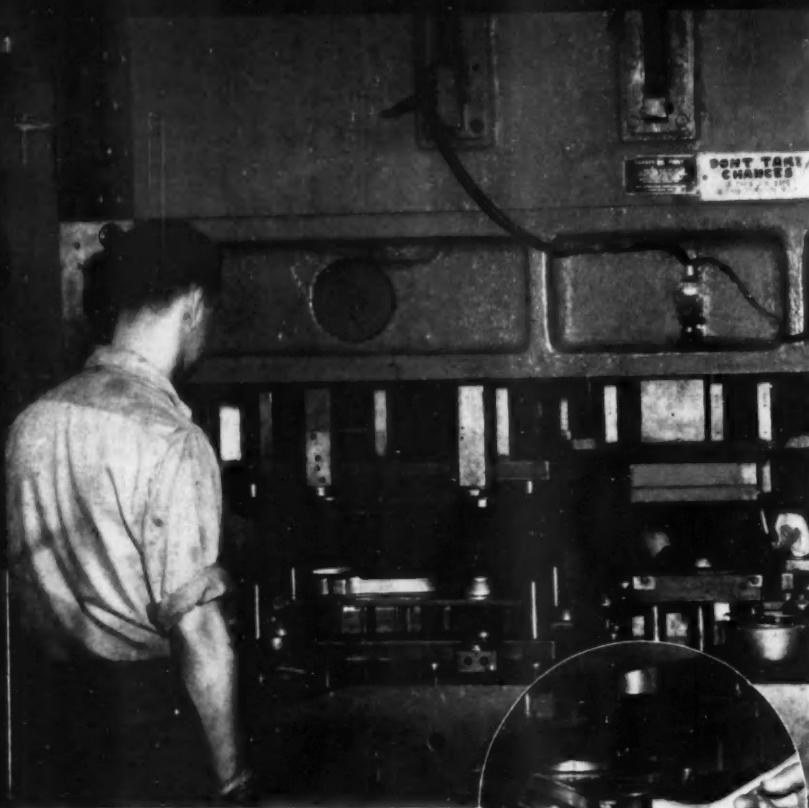
Supersonic Rocket Tests Continue

New High Temperature Aluminum Alloy

American Methods Adopted by Russia

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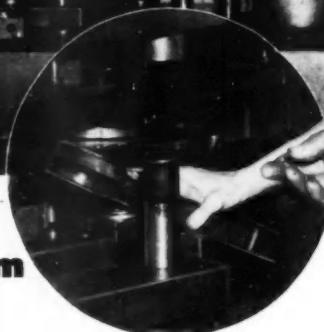
A CHILTON PUBLICATION



Pins down press room lubrication problem

THE lubrication of die set leader pins was a headache for New Monarch Machine and Stamping Company, Des Moines, until operators changed to CALUMET Viscous Lubricant No. 8X on the recommendation of a Standard Oil lubrication specialist. Replacing a cup grease, CALUMET Viscous Lubricant No. 8X has eliminated scoring and galling of leader pins caused by faulty lubrication. It is applied just once a day, shows up well on the pins.

CALUMET Viscous Lubricants are true greases fortified with additives. They have a high resistance to the washing action of water and to thinning and throw-off at high temperatures. Their adhesive quality makes them particularly effective in the lubrication of open gears and such special applications as the protection of leader pins.



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To apply the advantages of CALUMET Viscous Lubricants to your own operations anywhere in the Midwest, call for the services of the Standard Oil lubrication specialist in your area. Contact your local Standard Oil Company office or write: Standard Oil Company (Indiana) 910 South Michigan Avenue, Chicago 80, Illinois.

*What's your
problem?*



C. P. Rohde of Standard's Des Moines office is the lubrication specialist who applied the unique properties of CALUMET Viscous Lubricants to the solution of this problem. Like all Standard Oil lubrication specialists, he has a broad background of practical experience plus thorough training in Standard's own schools.

His on-the-spot service is typical of that available to industry everywhere in the Midwest. Making their headquarters at Standard offices throughout the area, these lubrication specialists are on call at all times to help you find the answers to problems involving lubricants and fuels. Arrange today to take advantage of this service by calling your local Standard Oil Company office. When the specialist calls, be sure to get information on these outstanding products:

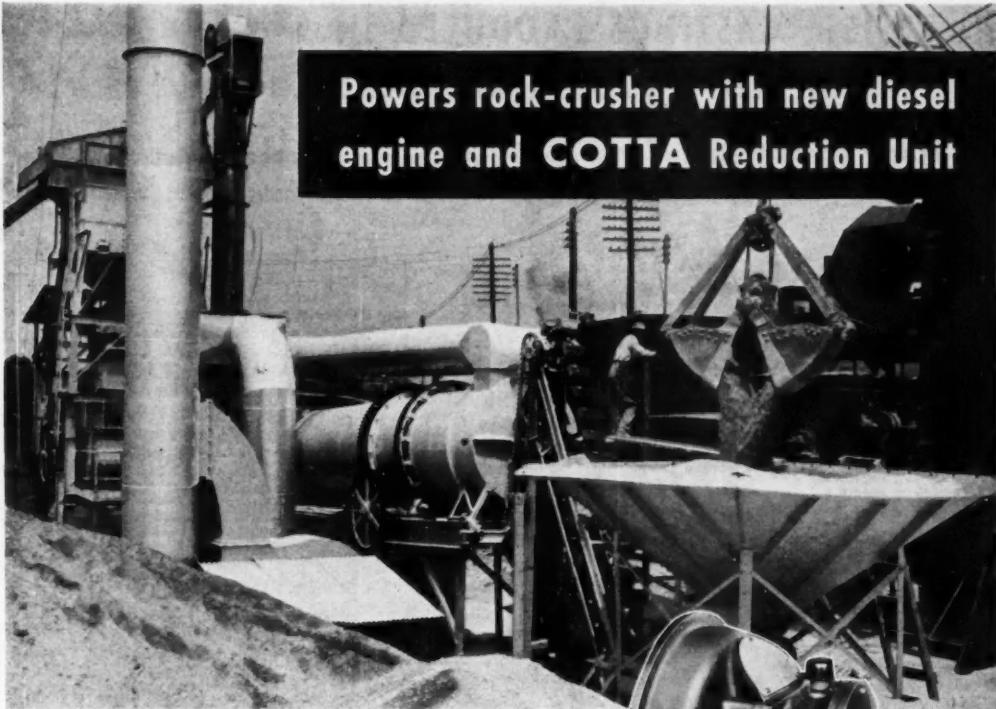
STANICOOL HD Soluble Oils—Because they contain additional compounding, these heavy-duty soluble oils possess not only the cooling ability of an emulsion but also the ability to give better tool life and finer finishes than can be obtained with a conventional soluble oil.

STANOSTAMP Compounds—Here are three established products for stamping or heavy drawing operations of either low-carbon or alloy steels. Water can be added to these paste compounds to provide the most economical applications. STANOSTAMPS offer maximum protection for dies and work. These compounds can be removed readily in conventional washing equipment.

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(Indiana)



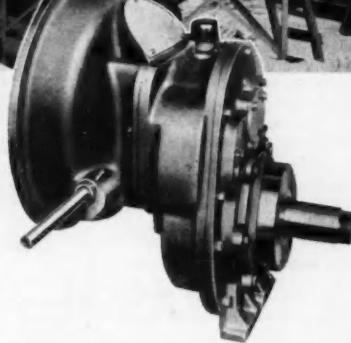
Powers rock-crusher with new diesel engine and COTTA Reduction Unit

One of several in use... pleased with performance

Sam Finley, Inc., of Atlanta operates fourteen asphalt plants in the Southeast. Diesel engines, with COTTA Reduction Units, are used in several of the plants to drive pugmills, dryers, or crushers. Most recent application is the powering of a rock crusher in Loganport, Louisiana. Here is another typical application of Cotta Reduction Units — adapting motor speed to the rpm required by operating parts. Do you have a speed reduction problem we can help you solve?

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For use on cranes, shovels,
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pumps, etc.



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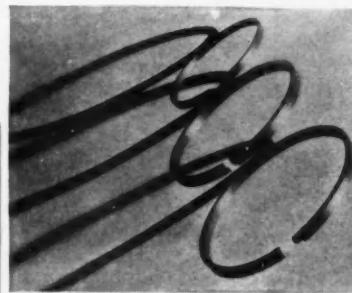
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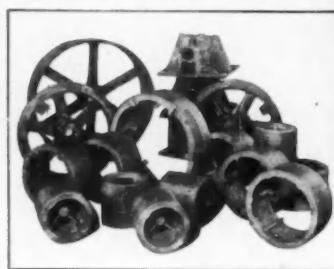
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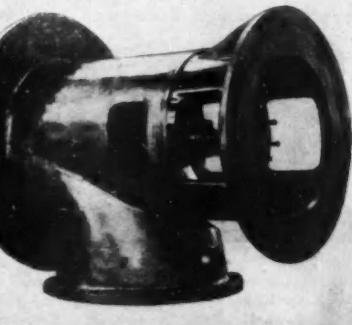
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At the present time the National Production Authority limits the applications for which nickel and its alloys may be used.

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NEW YORK 5, N.Y.

AUTOMOTIVE INDUSTRIES

Published Semi-Monthly

September 1, 1951

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AUTOMOTIVE INDUSTRIES, September 1, 1951

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*Name on request

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no ONE chain serves every purpose



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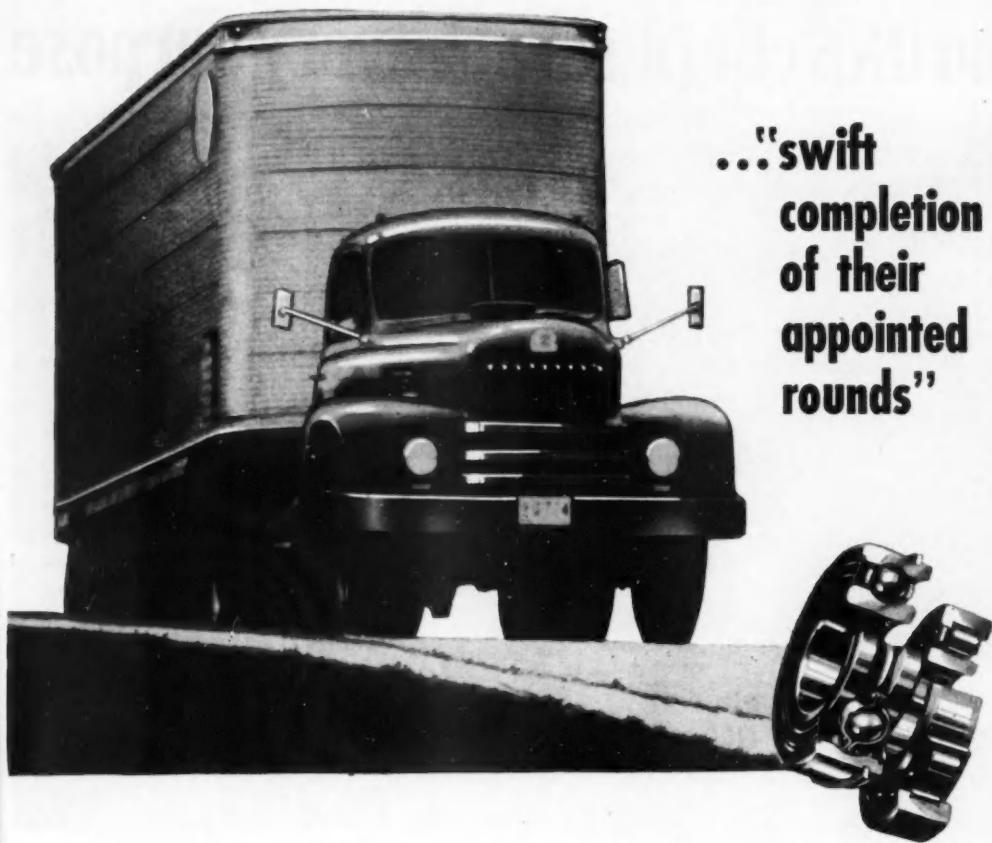
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Government Specification	Armstrong Material
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Type I Medium.....	NC-710
Type I Firm.....	NC-711
Type II Soft.....	DC-167
Type II Medium.....	DC-160
Type II Firm.....	DC-113
MIL-T-6841.....	{DK-153 RK-304S
MIL-T-6747	DK-149

New cork-and-rubber compounds. Armstrong's Research Laboratories are ready to develop cork-and-rubber materials to meet new military requirements as they arise. Please discuss your needs with your nearest Armstrong representative . . . or write.

Cork compositions. There is an Armstrong Cork Composition made to meet each of the classes under Federal Specification HH-C-576, as well as each of the grades under specification MIL-C-16090.

Synthetic rubber compounds. Armstrong manufactures highly specialized synthetic rubber compounds for certain critical applications. For example, Armstrong makes a rubber washer that meets the requirements of the aircraft fuel nozzles made under MIL-N-4180.

Armstrong's Gasket Materials

Your nearest Armstrong Industrial Division office

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Send for this gasket manual

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- Special Control Circuits
 - Pre-set Multiple Speeds
 - Threading
 - Inching or Jogging
 - Controlled Acceleration
 - Torque Limit
 - Eddy Current Braking
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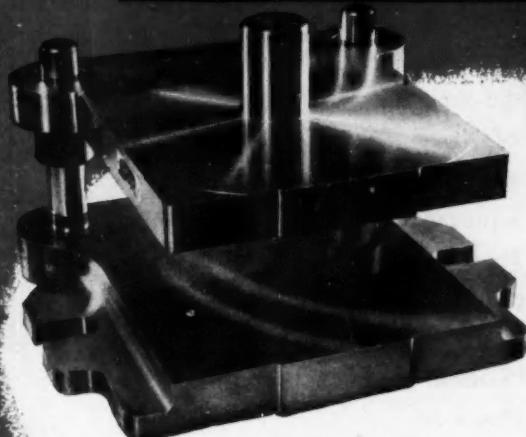
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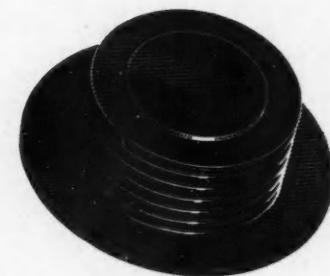
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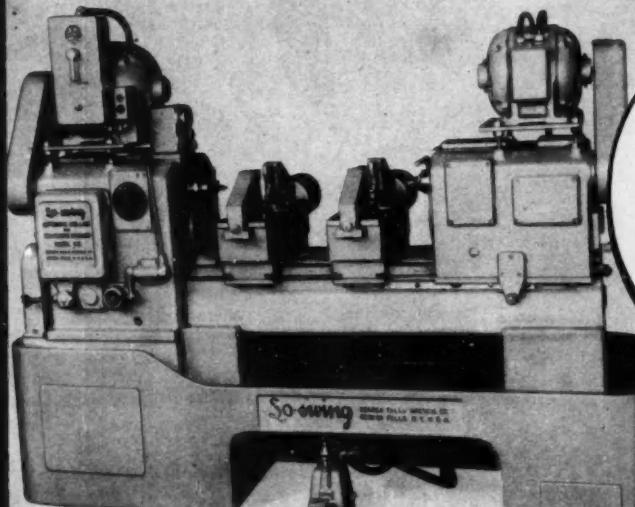
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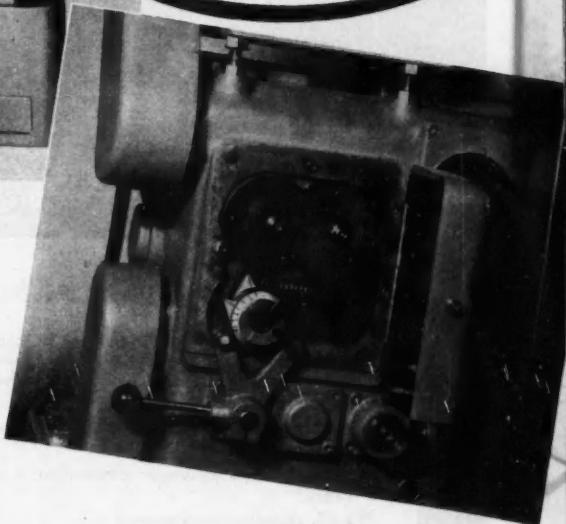
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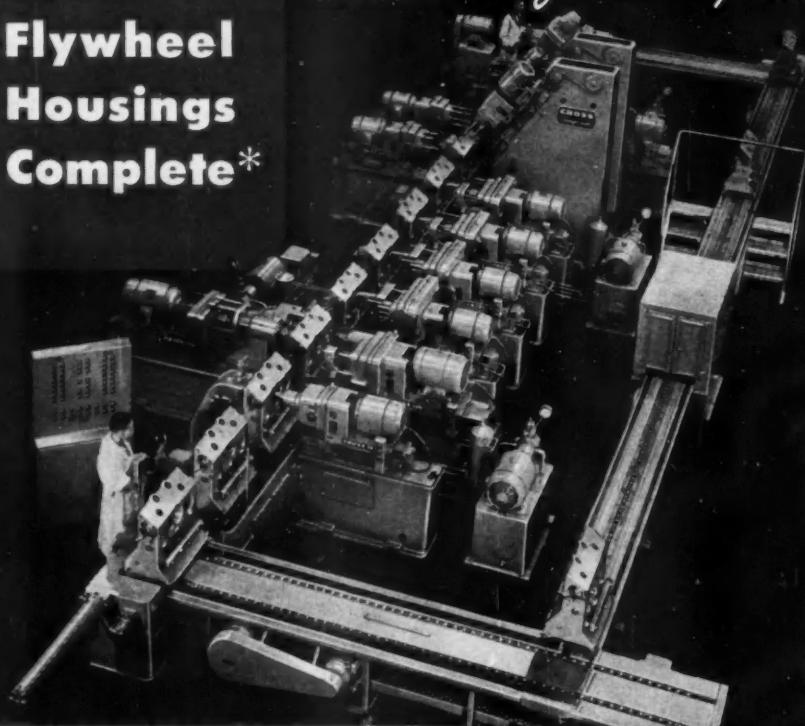
Model "CS" is available in four standard sizes, 18", 42", 66" and 90" between drills. Write for full information on this new cost-cutting equipment.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

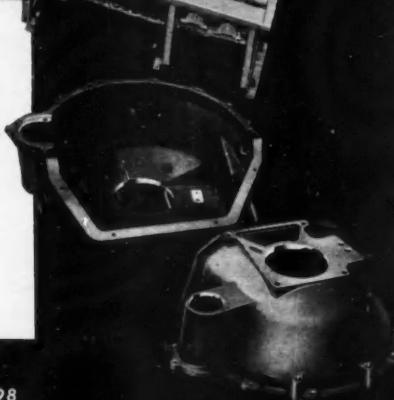
PRODUCTION COSTS ARE LOWER WITH *Lo-swing*

Machines Flywheel Housings Complete*

Another Transfer-matic by Cross



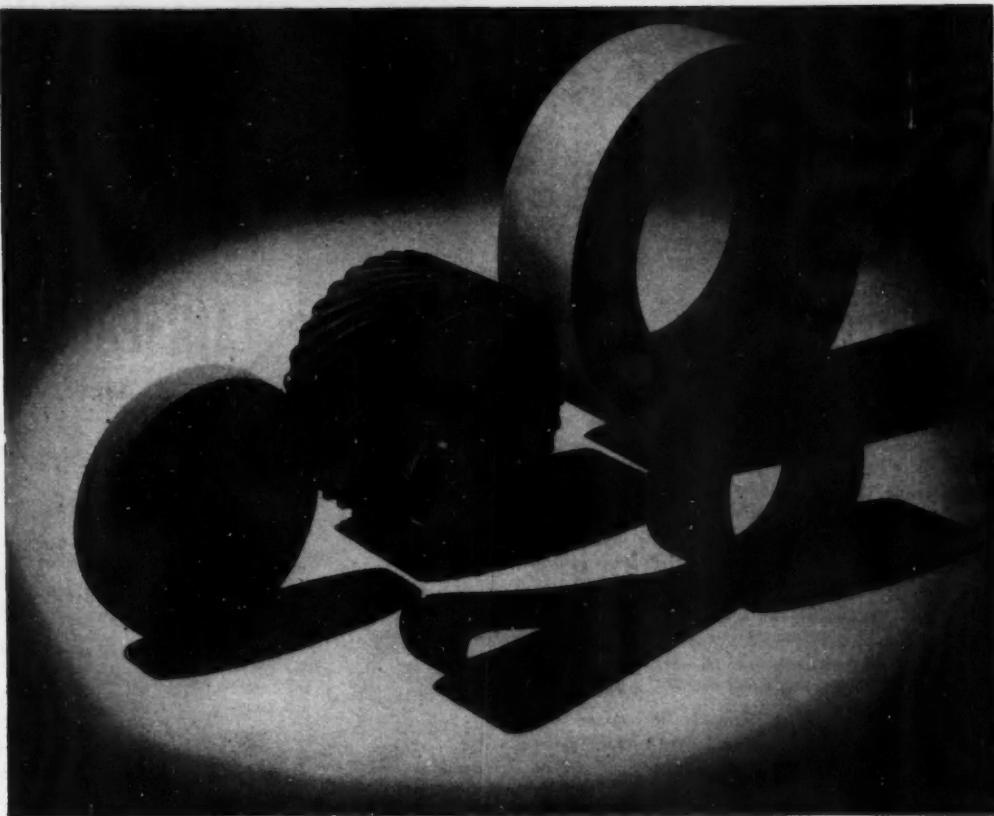
- ★ 138 flywheel housings per hour at 100% efficiency.
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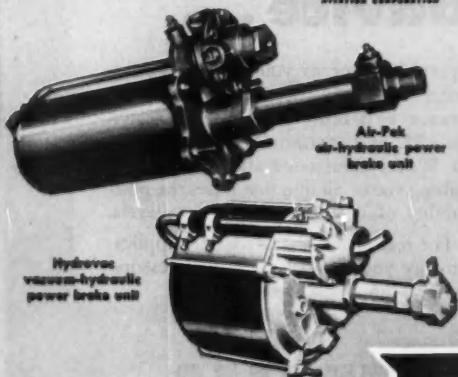
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High Spots of This Issue

Supersonic Rocket Missiles Tested at Secret Station

Wallops Island is the desolate Atlantic Ocean site of the Pilotless Aircraft Research Station of the National Advisory Committee for Aeronautics. This is the story of some amazing tests and procedures developed there. Page 34.

Assembling and Testing Automatic Transmissions

Here are described the assembling and testing of the Fordomatic and Merc-O-Matic transmissions at the rate of one per minute. The article is the third of a series on the manufacture of these Ford-Mercury units. See page 38.

Hot Spraying of Lacquer on Aircraft

As developed at the El Segundo Div. of Douglas Aircraft Co. the hot spraying of organic finishes on aircraft has become economically feasible. Page 42.

Improvements in GM Two-Stroke Diesels

Details concerning the radical improvements in the familiar GM 4-71 and GM 6-71 two-stroke Diesels are given in this account, beginning on page 46.

Buick XP-300 Engine

Designed strictly for experimental purposes with no thought to production considerations, the Buick XP-300 engine is used in GM's Le Sabre and Buick XP-300 "dream convertible." For specifications, photographs, and drawings, turn to page 49.

22 New Product Items

And Other High Spots, Such As:

The latest American methods employed by Renault in France; speeds up to 800 miles per hour at the National Air Races; production highlights in making turbine parts; news of the machinery industries; electrostatic atomization—a new painting process; a new aluminum casting alloy for higher temperatures; a system for mechanized handling of stocks of sheet metal; and a special six-press setup that stamps bearing retainers faster.

News of the Automotive Industries, Page 17
For Complete Table of Contents, See Page 3

AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES
• BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY •
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT
SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT

Entire profile of detent



Drawing of part, showing progress of operations. Stock removal indicated by heavy black lines. Production data:

Part name.....	Detent
Material.....	Steel forging
Operation.....	Broach profile complete
Stock removal.....	$\frac{3}{16}$ " average
Production.....	98 per hour, completely broached
Equipment.....	CINCINNATI No. 5-54 Duplex Vertical Hydro-Broach, toolied up by Cincinnati Application Engineers



Fixtures and broach inserts (cutters) mounted on a new CINCINNATI No. 5-54 Duplex Vertical, for broaching the profile of detents in four progressive operations.

BROACHED IN FOUR PROGRESSIVE OPERATIONS

Costs tumble when a machine can be toolied up for progressive operations on a multiple-operation part. This is especially true of standard machines, like the new CINCINNATI Duplex Vertical Hydro-Broach illustrated here. The equipment was designed by Cincinnati Application Engineers to broach the entire profile of detents in four progressive operations. ¶ There are two two-station fixtures holding one part in each station. Starting from the left-hand side of the left-hand fixture, the parts progress to the right. The four broaching operations and the stock removed during each, are indicated in the drawing. ¶ Does this give you an idea which can be applied in your own shop? Our Application Engineers will help you work out the details for high priority equipment. And if you're not familiar with new CINCINNATI Duplex Vertical Hydro-Broach Machines with receding tables, write for catalog No. M-1709-1. You'll agree that the new CINCINNATI's are worth waiting for.

**THE CINCINNATI MILLING MACHINE CO.
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CINCINNATI Duplex Vertical
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OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

CINCINNATI

News of the AUTOMOTIVE INDUSTRIES

Vol. 105, No. 5

September 1, 1951

Action Expected Soon on New Car Prices

Definite and favorable action is expected soon on requests for higher price ceilings on passenger cars applied for by the Big Three and some of the independents under the Capehart amendment of the new Defense Production Act. Applications generally request an increase of between 9 and 10 per cent, based on cost increases in the year preceding July 26.

NPA Cuts Fourth Quarter Truck Output 7 Per Cent

Fourth quarter production of trucks will be reduced about seven per cent below the third quarter rate, the National Production Authority has disclosed. NPA said that the fourth quarter CMP allotments will authorize production of 256,000 trucks—139,637 light; 83,780 medium; and 32,583 heavy. The allotment will be a unit limitation on production. Third quarter CMP allotments permitted production of at least 275,000 trucks.

Hudson Earnings Off Sharply From 1950

Hudson Motor Car Co. has reported a drastic reduction in earnings for the first six months of this year when compared with the same period a year ago. In the first half of 1951 the company earned a net profit of \$1,938,000 compared with \$6,547,000 in the same period of 1950.

GM's B-O-P Div. Buys 255 Acre Site

GM's Buick-Oldsmobile-Pontiac Assembly Div. has acquired a 255 acre site between Fort Worth and Dallas, Tex., for a possible future manufacturing or assembly operation.

Chrysler Net Shows Profit Squeeze

Earnings of Chrysler Corp. for the first six months of this year show clearly how high costs and price ceilings have set automotive company profits skidding. Net earnings of \$35.7 million represented 2.57 per cent of sales, con-



Combine Photos

ELEGANT METEOR

Entered by Competition Cars Ltd., Nayling Colchester, Essex, England, in the Southend on Sea England car rally and Concours D'Elegance recently, this new streamlined automobile, the Meteor, is powered by a BSA engine and has a speed of 75 mph.

trasted with 5.85 per cent during the first half of last year, when Chrysler was down for three months because of a strike. In a report to stockholders, K. T. Keller, board chairman, said that prospects for the last half of the year have been adversely affected by government controls on materials and that operations are being adjusted accordingly.

Fisher Body to Build Bullard Lathes

GM's Fisher Body Div. is reported to be completing details of an agreement with Bullard Co. under which the GM unit will build machine tools under license. NPA has approved a plan for the GM division to build the large vertical turret lathes which are critically needed for aircraft and other defense work. It is reported that Bullard currently has a capacity of about 40 of the machines a month, and back orders number about 2500. It is understood that Fisher will devote enough manufacturing capacity to the job to produce about 90 machines a month. There is also a report that Ford may take on a machine tool building job. Meanwhile, representatives of the automobile industry have reacted favorably to an NPA suggestion that a machine tool council, similar to the automotive coun-

cil for war production during World War II, be set up to assist in breaking the machine tool production log jam. Industry representatives, however, pointed out to NPA that excessive governmental red tape has discouraged automotive manufacturers and their suppliers from taking machine tool subcontracts and that some means should be devised to simplify subcontracting procedure. The Justice Dept. is reported to be willing to approve the formation of a machine tool council from the antitrust angle. In addition, Charles E. Wilson, Defense Mobilizer, has authority under the Defense Production Act to approve such an arrangement.

Willys Confirms Plans for Passenger Car

It now seems likely that Willys-Overland plans for a passenger car are maturing. Since the end of the war, Willys has been reported from time to time to be ready with an entirely new passenger car. Ward M. Canaday, Willys-Overland president, in a report to stockholders, confirmed that a new passenger car to accompany the present line of commercial vehicles will be introduced at the "proper time." He did not, however, give any indication as to when the car will be brought out. It is known, however, that Willys made

News of the AUTOMOTIVE



SLOWS DOWN

Studebaker designed and used at their 800-acre proving grounds this trailer apparatus called the dynamometer drawbar. With it they can produce the road load effects of a variety of abnormal road surface conditions with different adjustments of rheostats. Electrical current from standard batteries at the front of the unit flows, under control of the rheostats, to the eddy current dynamometer just behind the car bumper. This dynamometer sets up a strong retarding or slow-down force which is applied to the wheels of the trailer by connecting drive shaft and axle. This slow-down force results in a carefully calculated drag on the efforts of the car engine to pull forward.

application with NPA for steel for a new passenger car and the statement in the stockholders report may indicate a favorable reply from NPA. The report shows that Willys earnings for the first nine months of its fiscal year made a phenomenal recovery from the same time a year ago. Profit for the nine months was \$3,393,000 compared with \$232,239 in the corresponding period of 1950. As of the end of June, the Willys backlog of civilian and military business was approximately \$250 million.

Army to Buy \$5.4 Billion Worth of Vehicles in '52

An improved version of the Army's medium (M-47) tank and an amphibious cargo carrier with a pay load capacity of 1½ tons are two of the vehicles that the Army will buy in quantity if Congress grants the funds it requested during hearings on appropriations for fiscal 1952. According to testimony furnished by Ordnance officers to a House appropriations subcommittee, the Army expects to obligate some \$4.2 billion for tanks, tank recovery vehicles, and new armored vehicles in the present fiscal year. This is the largest single budgetary item in the Ordnance program, though other tactical vehicles are expected to cost nearly \$1269 million.

As usual, discussion of the heavy tank program was kept off the record. It is known that experimentation with

prototypes is continuing, but that the heavy addition to the tank family is not expected to be up to production requirements for some time. Revelation that a new amphibious cargo carrier, or "carriage," will be bought makes it apparent that the Army has given up its "weasel," developed in World War II for use over snow or in swampy terrain. Attempts were made in recent years to utilize the light, tracked vehicle as an arctic carryall, but performance limitations were revealed in such exercises as the "Sweetbriar" maneuver in Alaska in 1950. Correspondents covering the joint U. S.-Canadian exercise were more impressed with the operation of the Canadian "penguin" than

with the "weasel." The new carrier can float, according to one Ordnance officer. He also said that it can be used over difficult terrain or in heavy snow. Other New or improved vehicles described to congressmen were an armored infantry carrier, capable of carrying 12 men through light flat-trajectory fire, and a 155-mm self-propelled howitzer on a medium tank chassis.

Machine Tool Makers Get Super Priority

Importance of the machine tool industry is demonstrated by NPA action granting machine tool builders a super priority on metal working equipment required for expanding production. Tool builders may apply to NPA for the priority rating which takes precedence over all other users including the military.

Buick Ready to Start Tank Transmissions

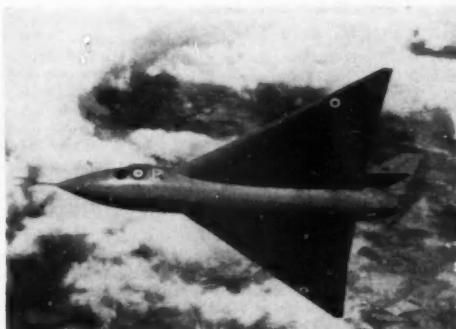
Buick will start production of tank transmissions soon, four months ahead of the scheduled starting date. The company has about 1.2 million sq ft of floor space, formerly used for automotive production, currently devoted to defense work and plans to increase that amount to four million sq ft within the next year, about half of which will be in a new engine plant being built at Flint.

Ryan Gets Orders for Ceramic-Coated Exhausts

Ryan Aeronautical Co. has announced volume production contracts for ceramic coating of exhaust systems. Approximately 600 sets for Pratt & Whitney engines, including spares, for the Convair model 240 and model 340

FIRST TIME

The British Avro Delta 707B research aircraft, shown here, was recently demonstrated in public for the first time at Surrey, England. The delta shape wing is said to enable the plane to carry heavy loads at high altitudes.



Acme

INDUSTRIES

transports will be ceramic-coated. In addition, Boeing Airplane Co., Seattle, has ordered ceramic-coated Ryan exhaust assemblies for all its B-50 bombers and C-97 Stratofighters under production for the Air Force. GE has given Ryan experimental orders for ceramic coating of the transition liners and inner combustion chambers Ryan manufacturers for the J-47 engine. Experimental work is also being conducted with Douglas Aircraft Co. and United Air Lines on ceramic coating of DC-6 transport exhaust stack assemblies, through service tests on actual scheduled runs. And on the ground, Continental Motors Corp.'s 825-hp engine for the General Patton tank will have ceramic-coated sections on the new manifolds due to get into production soon at Ryan.

B-W Division Tests New Amphibian

Ingersoll Products Div. of Borg-Warner has completed initial test runs

much of the work to be done in a plant being built in Detroit. The order calls for production of wings, flaps, elevators, rudders, fins, ailerons, bomb doors, and landing-wheel-well doors. Negotiations are also in progress with Boeing for Briggs to build control surfaces for the C-97 cargo plane.

Bill Jack Forms New Plane Parts Firm

W. S. (Bill) Jack, president of Jack and Heintz, Inc., during World War II, is planning to get back into the aircraft parts business. It is reported that he has been granted an emergency loan of \$2 million from DPA to purchase land and buildings, make improvements, and purchase equipment for the Bill Jack Scientific Instrument Co. of Solana Beach, Calif. The new company was formed about a year ago. Mr. Jack withdrew from Jack and Heintz following the end of World War II when the company became embroiled in a dispute

Kaiser-Frazer Corp., was sworn in on Aug. 21 as Deputy Administrator of the Defense Production Administration for production and procurement. At the same time, Mr. Bedford was named as chairman of DPA's Production Executive Committee and handed the job of breaking bottlenecks in production. In the job of deputy administrator, Mr. Bedford will have general supervision over other inter-agency committees concerned with production including the Electronics Board and the Small Business Executive committee.

Assisting him in expediting production through the Executive committee will be DPA Deputy Administrator Harold Boyer, who will continue, through his post of chairman of the Aircraft Production Board, to handle responsibility for aircraft matters. Another assistant, with similar responsibility for electronics matters, is Edmund T. Morris, Jr., chairman of the Electronics Production Board.

REGIONAL SALES OF NEW PASSENGER CARS

Zone	Region	June 1951	May 1951	June 1950	Six Months		Per Cent Change		
					1951	1950	June over May	June over June 1950	Six Months 1951 over 1950
1	New England	25,200	27,862	36,440	162,832	189,839	-9.45	-30.85	+1.75
	Middle Atlantic	63,305	87,674	117,092	535,561	537,500	+4.47	+20.32	+0.38
2	South Atlantic	54,992	51,900	71,804	332,483	342,157	+5.95	+23.41	+2.83
4	East North Central	112,223	122,730	147,822	720,544	705,741	-8.96	-24.06	+4.27
5	East South Central	20,705	18,486	30,622	129,334	151,070	+8.25	+33.04	+14.59
6	West North Central	48,049	50,463	64,076	251,851	265,903	-4.82	-25.02	+1.34
7	West South Central	38,279	36,833	44,032	244,249	249,945	+3.91	+13.07	+2.29
8	Mountain	14,622	14,790	22,398	83,246	98,449	-1.50	+34.72	+5.30
9	Pacific	47,290	48,674	49,348	208,660	214,338	+2.84	+4.17	+1.85
Total—United States		454,665	470,446	563,937	2,800,967	2,829,982	-3.36	-22.14	+0.76

States comprising the various regions are—Zone 1: Conn., Me., Mass., N. H., Ala., Ky., Miss., Tenn.—Zone 2: Iowa, Kan., Minn., Mo., N. D., S. D.—Zone 7: R. I., Vt.—Zone 3: N. J., N. Y., Pa.—Zone 4: Del., D. C., Md., Md., Ark., La., Okla., Tex.—Zone 8: Ariz., Colo., Ida., Mont., Nev., N. M., Utah, N. C., S. C., Va., W. Va.—Zone 5: Ill., Ind., Mich., Ohio, Wis.—Zone 6: Wyo.—Zone 9: Cal., Ore., Wash.

on a pilot model of a new tracked landing vehicle for the Navy and Marine Corps at its Kalamazoo, Mich., plant. Further testing will be required before the vehicle, which is completely new in design and much larger than its World War II prototype, will be ready for mass production. The tank will also be made by other manufacturers, although Ingersoll is the major producer and is also the central procurement and design agency for the Navy's amphibian tank program. During World War II the Ingersoll Kalamazoo plant designed and produced the LVT-3 from 1943 through 1945.

Briggs Gets Contract for Bomber Parts

Briggs Manufacturing Co. has received a multi-million dollar contract from Boeing Airplane Co. to build major assemblies for the B-52 heavy bomber. Engineering and tooling are already underway and production is scheduled to start early next year with

with the government over excess profits on war contracts. The firm received wide notice because of its high production and high wages, salaries, and bonuses to employees.

American Brake Shoe to Make Parts for Wright

The American Brake Shoe Co. has entered into a contract with the Wright Aeronautical Corp. to manufacture parts for the Air Force J-65 Sapphire jet engine. The brake shoe company will build a new foundry at Medina, N. Y., to produce the parts for Wright and other manufacturers of the Sapphire jet engine. The foundry will be operated by the company's Engineered Castings Div.

Bedford is Deputy DPA Administrator

Clay P. Bedford, on leave from his post as executive vice president of

GM Gets Fast Writeoff on Defense Plants

GM has received certificates of necessity for defense production plants in four cities. The certificates provide for fast amortization of GM's investments in these plants, which is said to total more than \$50 million. The plants are at Pontiac, Flint, Vandalia, O., and Anderson, Ind.

Chevrolet to Utilize Own Plants for War Work

In order to hold employment as high as possible in its own plants during the anticipated restriction of automobile production, Chevrolet is planning to do much of its own manufacturing of components for the Wright R-3350 engine for which it holds contracts. Chevrolet officials have surveyed all of its manufacturing plants and will place as much defense work in them as there is open capacity.

News of the AUTOMOTIVE

AC Spark Plug Gets Gunsight Order

GM's AC Spark Plug Div. has been awarded an Air Force contract to build gyroscopic gunsights for machine guns used on fighter planes. Amount of the order was not revealed. During the last war, AC built about 33,000 gunsights for the Air Force.

American-LaFrance-Foamite to Make USAF Crash Trucks

The American-LaFrance-Foamite Corp., Elmira, N. Y., has been awarded U. S. Air Force contracts for the manufacture of special crash trucks to be

a large military program is considerably longer. When it is completed, total productive capacity will be such that both war goods and a fairly high level of civilian production will be carried on simultaneously. Such a program brings up the question of whether or not there will be enough basic raw materials to meet the requirements of both segments. While steel and aluminum producing facilities are being expanded, it will take a considerable period to bring the supply into balance with the program of combined operations, and shortages appear to be a continuing prospect for the next year or two at the very least. It all depends, of course, upon the pace of military production,

away. NPA is now permitting mills to reject orders from these new customers in order to put established customers on the schedule. Steel companies can accept or reject orders up to 15 days before expiration of lead time set for individual steel items. It is now certain that passenger cars will be under CMP in the fourth quarter, but many in the industry think that the program is likely to become so involved that they will have more difficulty getting controlled materials than they currently are experiencing in the free market.

Name Wood Consultant to DPA Aircraft Board

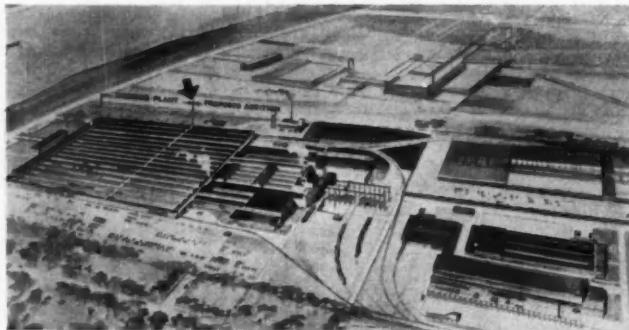
John G. Wood, veteran automotive engineer, has been appointed consultant to the Aircraft Production Board, the Defense Production Administration has announced. Mr. Wood will work with Harold R. Boyer, DPA Deputy Administrator for Aircraft Production, on problems arising in the expanding aircraft engine program. Mr. Wood retired as chief engineer of GM's Chevrolet Motor Div. in January, 1950.

Continental Motors Production Soars

Continental Motors is in heavy production of engines for the armed services, and expects to turn out approximately 475,000 units for civilian and military use by the end of its current fiscal year, Oct. 31. The company estimates that its sales for the year will be \$160 million, or 66 per cent ahead of 1950. The order backlog now approximates \$250 million. Currently in production are three aircooled engines for the military, rated at 375, 500, and 810 hp for use in tanks and other combat vehicles. Three other sizes of the engine, which was developed in cooperation with Army Ordnance after World War II, are scheduled to go into production later. Continental has also developed a new line of aircooled engines for Air Force ground installations. The series includes six models ranging from 15 to 250 hp and consisting of 1-, 2-, 4-, 6-, and 8-cyl design. The engines will start at -65°F and have a high degree of interchangeability of parts with the regular Continental line of airplane engines.

First Half Car Dividends Were \$273 Million

Statistics compiled by the Office of Business Economics from public reports indicate that the automobile manufacturing and oil refining industries led all others during first half 1951 in dividend payments, both in rates and dollar volume. Dividend payments re-



ONE MILLION MORE!

The proposed million-square-foot expansion in the Buffalo area of GM's Chevrolet Motor Div. is shown here in relation to existing plants in Tonawanda, N. Y. The Chevrolet-Tonawanda manufacturing plant (see arrow and dotted line, upper left) is to be expanded by a 360,000 sq ft addition. Other new construction will include a 370,000 sq ft Chevrolet foundry (center), and a 203,000 sq ft Chevrolet forge plant (lower right). All will be used in the manufacture of Wright R-3350 aviation engines for the Air Force and Navy.

used for the fire fighting purposes at and near airports. Company officials said the contracts "aggregate several million dollars."

Materials Shortages Loom as Output Soars

One fact that is too little recognized in the current troubled period is that an attempt is being made to superimpose a whole new defense economy on top of a civilian economy at a relatively high level. In 1942 when many of the same problems were occurring, the effort was all toward a complete military production program with manufacture of only the most vital civilian goods permitted. In other words, the problem then was conversion, whereas today it is expansion. Consequently, the time for getting into

which in turn hinges on world developments.

Difficult days lie ahead for automobile production, but there is no general belief in the industry that operation will close down this Fall for a complete lack of materials. Steel and copper are both critical, and there will conceivably be some scattered closing of plants for short periods because of supply difficulties, but on the whole, the industry expects to keep going at a rate not too far from that permitted under NPA allocations. NPA is already taking steps to straighten out the mess caused by the "first come first served" requirement under CMP, which has dislocated distribution of steel because many small buyers who had previously bought from warehouses received early CMP tickets and were getting on mill schedules in such great numbers that old customers with large allotments were being turned

INDUSTRIES



FOR FLYING FARMERS

This is Civil Aeronautics Administration's agricultural plane, designed and built with the cooperation of the Dept. of Agriculture, agricultural flying operators, the Flying Farmers and several airplane manufacturers. The wire from the cockpit canopy to the vertical fin will protect the tail surfaces from wires in case a pilot has to fly beneath them. The forward edges of the landing gear struts are sharpened so as to cut the wires of a fence if a collision cannot be avoided. The plane was designed and built for the CAA by the Personal Aircraft Center of Texas A & M College. Plans and specifications for the plane will be made available by the CAA to any manufacturer.

ported publicly for industry as a whole amounted to \$3.6 billion for the half-year, an increase of about 25 per cent from 1950. Automobile manufacturers paid out to their stockholders some \$273 million for the period against \$211 million last year, an increase of 29 per cent. This was second only in dollar volume to the oil companies which paid out \$395 million compared with \$318 million last year, representing a percentage increase of 24 per cent. Public reports account for approximately 65 per cent of all dividend payments.

K-F Plans Increase in Car Production

Kaiser-Frazer expects to increase its automobile production this fall if an automobile shortage develops as the company now expects. Edgar F. Kaiser, president, says that it has a firm commitment from NPA that a request for permission to step up to an allocation of 3 per cent of industry production will be granted at any time the company asks for it. K-F's current allocation is 1.5 per cent. The company expects to complete its first C-119 cargo plane sometime this fall with peak production to be reached about next May. At that time aircraft and automobile business are expected to be about equal dollar-wise. He also revealed that sometime next summer, production of the C-119 will be phased out and facilities converted to output of the Chase C-123 cargo plane. Manufacture of sub-assemblies for the C-119 began late in June.

About 3500 persons are now em-

ployed on the aircraft job and employment will rise to 6000 late this year. About one-third of the Willow Run plant has been set aside and is being toolled for aircraft production, with the balance of the plant or more than two million sq ft of space devoted to automobile production. K-F will manufacture approximately 65 per cent of the C-119 air frames. Major subcontractors are Whirlpool Corp., Gibson Refrigerator

Corp., and Murray Corp. of America. About 700 companies in 26 states supply parts and materials.

General Tire Buys Assets of Thermoid Canadian Unit

Thermoid Co.'s wholly-owned Canadian subsidiary, Joseph Stokes Rubber Co., Ltd., has concluded arrangements for the sale of substantially all of its assets to the General Tire and Rubber Co., Ltd., of Canada. Stokes of Canada will be able to repay indebtedness to a Thermoid affiliate in the amount of \$750,000. In addition, Stokes will receive an estimated \$3 million in cash and notes of the buyer. The exact amount is partly dependent upon a July 31, 1951, audit which should be completed by Oct. 1.

Car Industry Plunges Into Scrap Collection

The automobile industry has plunged into an all-out scrap collection drive with a six-point program. The industry wide drive is under the sponsorship of a special scrap sub-committee of the Automobile Manufacturers Association, headed by J. A. LaCourse of Packard. The program calls for each company to appoint a committee with full responsibility for seeking out dormant scrap; a thorough search of all plants and properties for obsolete tools, dies, jigs, fixtures, inactive service parts, and similar scrap; immediate channelling of all such scrap into trade channels;

1951 NEW PASSENGER CAR REGISTRATIONS*

Arranged by Makes in Descending Order According to the 1951 Six Months' Totals.

SIX MONTHS

MAKE	June 1951	May 1951	June 1950	Units		Per Cent of Total	
				1951	1950	1951	1950
Chevrolet.....	94,921	98,061	123,388	606,602	686,123	21.87	23.62
Ford.....	79,557	82,330	106,962	487,196	574,071	17.35	20.31
Plymouth.....	57,016	57,105	54,310	302,977	319,460	10.80	8.60
Studebaker.....	33,018	34,105	44,105	221,061	243,513	7.17	8.98
Pontiac.....	27,732	28,615	38,616	184,800	243,851	5.88	7.40
DeSoto.....	27,639	28,637	29,546	187,570	94,180	5.62	3.33
Oldsmobile.....	23,419	25,923	31,049	153,013	178,269	5.45	6.23
Mercury.....	21,175	22,302	30,153	128,374	160,064	4.57	5.04
Graham.....	18,283	17,585	20,312	105,926	140,678	3.76	5.18
Studebaker.....	14,289	14,170	14,170	67,777	47,545	3.18	1.98
Nash.....	11,705	11,410	18,780	67,981	69,986	2.39	3.17
De Soto.....	10,508	10,350	12,085	58,776	35,197	1.24	1.24
Hudson.....	7,940	8,010	14,072	67,612	72,863	2.06	2.87
Cadillac.....	7,692	8,301	8,839	51,266	38,547	1.83	1.30
Packard.....	5,150	5,504	7,146	36,597	37,946	1.30	1.34
Kaiser.....	4,411	4,500	9,575	30,440	24,677	1.10	.87
Henry J.....	4,612	4,887	—	30,516	—	—	—
Willys.....	2,903	2,227	3,447	14,019	14,064	.50	.53
Lincoln.....	1,869	2,119	3,021	13,710	16,190	.49	.57
Crosley.....	478	479	512	3,078	3,204	.11	.11
Frazer.....	—	2,208	—	7,942	—	—	—
British Austin.....	239	280	300	1,765	2,844	.06	.10
British Ford.....	237	274	110	1,473	1,453	.05	.02
Misc. Domestic.....	238	216	87	1,036	108	.04	.04
Misc. Foreign.....	1,087	1,025	583	8,231	2,041	.22	.09
Total—All Makes	454,685	470,448	560,937	2,808,586	2,829,952	100.00	100.00

*Based on data from R. L. Polk & Co.

News of the AUTOMOTIVE

authority to suppliers to dispose of obsolete equipment held to automotive company accounts; careful segregation of all scrap; and urging of automobile dealers to cooperate with local scrap mobilization committees.

The steel industry also has a nation-wide scrap collection drive underway. Under the program, about 2000 steel industry representatives will comb the country for worn-out and obsolete machinery and equipment that is no longer usable. The industry estimates that 36 million tons of scrap will be required this year, compared with 24.5 million tons during the highest World War II year. Scrap inventories are at a very low level at a season when they would normally be high. During winter months, scrap deliveries normally fall because of collection difficulties. Chrysler reports that its scrap drive has netted more than 2100 tons thus far and is continuing. The drive is in addition to its regular production scrap program which yields about 35,000 tons a month. The company has turned up a large amount of scrap from its own and suppliers' tools and dies held for making service parts and which are no longer required for that purpose.

Stratos Gets License for French Gas Turbine

Exclusive rights in the United States for the manufacture and sale of a French gas turbine auxiliary power plants, the Orédon, have been obtained by the Stratos Div. of the Fairchild Engine and Airplane Corp.

Ford is taking another step in its program of eliminating unprofitable outlying plants by negotiating the sale of its large Iron Mountain, Mich., industrial property. Major operation at the plant has been station wagon body assembly. The operation was originally based on the large supply of wood available locally, but since the trend from wood to steel bodies has proved unprofitable because of the required shipping of materials from Detroit to the factory and shipment of bodies back to Ford.

GM's Harrison Radiator Buys Large Tract

Purchase of 89 acres of land, adjacent to the West Lockport, N. Y., plant of GM's Harrison Radiator Div., on which options were taken by the company last May, has been completed. The purchase price was not disclosed, but was reported to be approximately \$50,000.

Chrysler Develops New Acceleration Tester

The engineering division of Chrysler Corp. has developed a new electronic instrument to measure acceleration of automobiles under test more accurately. It is designed particularly to record acceleration from the exact instant of getaway and will measure to hundredths of an inch the distance traveled

in each 1/30th of a second in a car's start. The instrument operates by recording timing marks made by a regularly repeated spark on wax paper tape which is pulled through the instrument by the car being tested, thus giving an accurate combination of distance traveled and elapsed time.

Mack Building New Parts Plant

Mack Trucks, Inc., has begun construction of a new service parts plant at Bridgewater, N. J. When completed, it will free up available production space at the Plainfield, N. J., engine and machine plants, making available about 300,000 sq ft of area for expansion of engine and transmission production.

Ford Takes Up Option on 427 Acres in Canada

Ford Motor Co. of Canada, Ltd., announced that it is taking up its options on 427 acres of land about 20 miles west of Toronto, Canada. In making the announcement, Theodore J. Emmert, executive vice-president of Ford of Canada, said: "We are convinced the automotive industry will contribute to, and share in Canada's expanding future. It is with this long-range view in mind that we have purchased this property."

ECA Increases Group of Metal Show Visitors

ECA and the Organization for European Economic Cooperation have expanded their sponsorship of groups who will attend the World Metallurgical Congress in Detroit, Oct. 14-19. The two organizations will sponsor three additional technical assistance missions, which will add another 100 scientists and metal producers who will attend the Congress from 21 nations and will bring the total to more than 400. The American Society for Metals, which sponsors the Congress, has arranged study tours of American industry before the exposition, on which 200 visitors will travel through 57 cities and 13 states with expenses and sponsorship shared by ECA. Three ECA tours following the metal show are being arranged.

F-86-E Sets World Record in National Air Races

America's best answer in the controversy over the relative quality of the world's jet fighting planes emerged from the National Air Races at Detroit, according to Admiral DeWitt C. Ram-

1951 NEW TRUCK REGISTRATIONS*

Arranged by Makes in Descending Order According to the 1951 Six Months' Totals.

MAKE	JUNE		MAY		JUNE		SIX MONTHS	
	1951	1950	1951	1950	1951	1950	1951	1950
Chevrolet.....	32,621	33,297	38,438	38,931	185,844	35,28	38,41	38,41
Ford.....	22,181	23,281	25,773	22,065	145,440	24,82	26,49	26,49
Dodge.....	10,447	9,809	10,809	10,509	52,102	10,02	9,75	9,75
G. M. C.....	8,481	8,672	7,304	8,724	41,901	8,23	8,23	8,23
International.....	6,643	7,546	7,626	48,363	46,030	8,89	9,02	9,02
Studebaker.....	2,574	2,438	3,520	15,540	22,704	3,01	4,46	4,46
Willys Truck.....	1,130	1,335	1,385	8,102	6,104	1,57	1,20	1,20
White.....	1,071	1,170	900	6,785	5,014	1,31	.98	.98
Mercury.....	949	980	980	4,486	4,000	1,12	.90	.90
Willys Jeep.....	777	879	724	4,459	3,988	.96	.78	.78
Diamond T.....	384	481	436	2,529	2,631	.48	.32	.32
Dodge.....	304	369	308	2,107	1,805	.41	.35	.35
Reo.....	308	284	271	2,002	1,520	.30	.30	.30
Brockway.....	136	208	186	1,326	987	.28	.19	.19
Autocar.....	165	222	186	1,181	973	.23	.19	.19
Farmer.....	13	133	104	624	603	.12	.12	.12
Pontiac.....	62	62	138	367	906	.06	.06	.06
Kenworth.....	55	65	63	387	263	.07	.05	.05
F. W. D.....	31	37	24	253	154	.05	.03	.03
Sterling.....	27	40	28	188	167	.04	.03	.03
Peterbilt.....	9	33	—	164	134	.03	.03	.03
Misc. Domestic.....	100	138	134	702	882	.15	.17	.17
Misc. Foreign.....	14	28	29	121	212	.02	.04	.04
Total—All Makes	97,481	90,627	91,512	518,975	510,428	100.00	100.00	100.00

* Based on data from R. L. Polk & Co.

INDUSTRIES



STRIKING SCORPION

This photograph shows the latest armament details on the U. S. Air Force's most heavily-armed all-weather interceptor, the Northrop-built Scorpion F-89. Five-in. high velocity aerial rockets streak from the wings during air-to-ground firing near Edwards AFB, Muroc, Calif. The F-89 carries six 20-mm cannon in addition to having provisions for 16 five-in. HVAR rockets, eight under each wing. The plane has been announced as being in the "600-mph class."

sey (USN, Ret.), president of the Aircraft Industries Association. Not only did an F-86-E jet Air Force fighter streak over a 100-km (62.137 miles) closed course at a new world record speed of 628.698 mph, but other jet fighters and bombers demonstrated superior range and maneuverability throughout the course of the show. Among high points of the Allison, Bendix and Thompson races were non-stop flights of about 2000 miles by standard Air Force jets. In addition to this display of long-range jet characteristics, mid-air refueling of combat-ready aircraft was demonstrated. The new closed-course mark of 628-plus mph, set by Col. Fred J. Ascari, betters the previous English record of 605.239 mph flown by John Derry in 1948 in a de Havilland DH 108. In an earlier test Col. Ascari flew the same oval course at 635.411 mph, a record which also will be submitted to the Federation Aeronautique Internationale for certification. FAI is the world record governing body.

AMA Facts and Figures Near Publication

Essentiality of passenger cars is prominently featured in the forthcoming 1951 edition of *Automobile Facts and Figures*, to be published soon by the Automobile Manufacturers Association. Considerable space is devoted to comprehensive surveys made earlier this year showing use of automobiles for earning a livelihood, shopping, and other uses. The publication also points out the several new records which were made by the automobile industry last

year in production, registration, fuel consumption, mileage driven, and special taxes. In addition, it has the usual comprehensive tables and data relating to all important segments of the industry.

Industry Still Hopes to Kill Excise Hike

There is still a faint hope that a proposed 3 per cent increase in excise taxes on automobiles, trucks, and repair parts may be defeated in Congress. At any rate, opponents of the increase have been working hard trying to convince the Senate Finance Committee that the move is unwise and discriminatory.

1950 Automotive Taxes Up 24 Per Cent

American automobile and truck owners in the last Federal fiscal year paid 24 per cent more in excise taxes than they did in the preceding year, according to Treasury figures. The report states that excise taxes on cars, trucks, buses, tires and tubes, parts and accessories, and gasoline and oil totaled \$1,758,000,000 for the year ending last June 30, an increase of almost \$340 million over the preceding year. In addition, owners also paid heavy gasoline and other automobile taxes to states and in some cases were assessed local levies.

Dynaflow and Hydramatic Total Four Million

Two GM divisions have produced nearly four million automatic transmissions since the end of World War II. Detroit Transmission Div. early in August completed its three millionth automobile type Hydra-Matic transmission and at about the same time Buick announced that it had built one million Dynaflow units. Significantly, of the three million Hydra-Matics, only about 200,000 were built before the war with 2.8 million being turned out since 1945. Buick began production of the Dynaflow in 1948.

Two Year Intervals For Italian Car Shows

Italian automobile shows will be held at intervals of two years, according to a decision just taken by the National Manufacturers' Association. The next exhibition, therefore, will be in 1953, at Turin, probably during the month of April.



GROUND BREAKING FOR GUIDED MISSILES

The nation's first integrated facility for mass production of guided missiles, the \$50 million Navy-Consolidated Vultee Aircraft unit, was dedicated in ground-breaking ceremonies at Pomona, Calif. The main manufacturing building is to be 1230 ft long and 600 ft wide. Construction is scheduled for completion some time in 1952.

News of the AUTOMOTIVE INDUSTRIES



A NOSE FOR SUBS

The Navy's Martin PSM-1 Marlin flying boat takes off from the waters of Chesapeake Bay. A substantial number of Marlins are being built for the Navy by the Glenn L. Martin Co. Powered by two Wright turbo-compound engines, each developing 3250 hp, the Marlin is equipped with the latest electronic devices for the detection of submarines.

Fruehauf Trailer Net Shows Big Gain

Fruehauf Trailer Co. reports a net profit for the first six months of this year of \$3,651,000, compared with \$2,655,000 for the same period a year ago. Fruehauf is currently converting part of its facilities to defense work, which will amount to about 30 per cent of sales by October.

Heald Celebrates 125th Anniversary

The Heald Machine Co., Worcester, Mass., is celebrating its 125th anniversary. Open house will be held Sept. 10-13, featuring exhibits of their machines under construction, a historical exhibit and plant tours. Commemorating this event Heald has published an extremely attractive booklet entitled "Yesterday 1926—Today 1951—Tomorrow."

Italian Car Industry Active Overseas

The Ansaldo-Fossati Co. of Genoa Sestri has sold the license for its 60-hp tractors to the Yugoslav Government which is to start the construction of such vehicles near Belgrade with parts and engines to be imported from Italy. Ansaldo-Fossati is to associate itself with British Diesel engine manufacturers in the export of 120-hp Diesel tractors to Australia where an assembly factory is to be built for these tractors with the cooperation of Italian skilled workers whose immigration is

to be allowed by the Australian Commonwealth Government.

The Colombian Government has requested that the Alfa Romeo company transfer its obsolete works to Bogota to start a Colombian automobile industry following the example of the enterprise started by the Fiat Co. in Mexico.

McCulloch Motors Buys Rhodes Lewis

McCulloch Motors Corp., Los Angeles, has purchased Rhodes Lewis Co., Culver City (Los Angeles area), engineers and manufacturers of aircraft components. Contracts totaling more than \$8 million between Rhodes Lewis and the armed forces and major airframe manufacturers will remain in force, according to the announcement by Robert P. McCulloch, president.

To Hold Second Motorama in Los Angeles

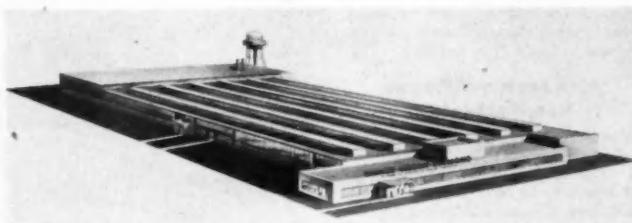
The Second Annual Motorama will be held at the Pan Pacific Auditorium, Los Angeles, Nov. 7 to 11. Exhibits will be devoted to hot rods, custom and foreign cars, motorcycles and racing boats. A special feature will be an exhibit by the Art Directors Club of Detroit showing automotive artwork done by advertising agencies for the Detroit automobile manufacturers.

Federal Has Power Chief Engines

Improved valving and positive exhaust valve rotation are features of a new series of heavy-duty truck engines, called the Power Chief line, introduced by the Federal Motor Truck Co. These six-cyl, valve-in-head, gasoline-powered engines are made in two displacement sizes—371 cu in. and 427 cu in. The 371 cu in. model is used for the new 3400 Style-Liner series trucks while the 427 cu in. engine is for the 45 and 55 heavy-duty series.

Du Pont Develops New Way to Add Neoprene to Paper

The Du Pont Co., after spending three years and almost a million dollars on research, has developed a new and economical way to add its synthetic rubber, neoprene, to paper. Instead of coating or saturating the finished paper, as in older methods, the neoprene is now added in latex form to the pulp just before it is made into paper. The result is a new family of low-cost specialty papers made directly on the paper machine.



DOUBLES CAPACITY

This is the new plant in Plymouth, Mich., of the Barnes-Gibson-Raymond Div. of Associated Spring Corp. Located on a site of 50 acres, the new plant began operations on Sept. 1. The new one-story factory doubles the productive capacity of the company's former Detroit plant.

Men in the News

Current Personnel Appointments and Changes at Plants of Automotive Manufacturers and Their Suppliers

Wright Aeronautical Corp.—Stanley B. Kurzina, Jr., has been made vice-president in charge of operations.

United States Rubber Co.—Herbert E. Smith, chairman of the board of directors and former president, has retired. Mr. Smith will continue as a director and member of the finance committee. H. E. Humphreys, Jr., will succeed him.

Allis-Chalmers Manufacturing Co.—J. L. Singleton, vice-president in charge of the general machinery division, and R. S. Stevenson, vice-president in charge of the tractor division, have been elected to the board of directors. W. E. Hawkinson, secretary and treasurer, was named a vice-president, secretary and treasurer.

Bendix Aviation Corp., Bendix Radio Div.—George R. Faustman has been named general factory manager.

Illinois Tool Works—A. F. Zamis has been appointed chief engineer.

Consolidated Vultee Aircraft Corp., Guided Missile Div.—C. R. Irvine has been appointed assistant division manager and chief engineer.

Dearborn Motors Corp.—A. E. Carter has been named manager of the manufacturing department.

Automotive Rubber Co., Inc.—The appointment of R. A. Lees as general plant manager has been announced.

H. K. Porter Co., Inc., Hinderliter Tool Co., Div.—L. L. Garber, vice-president, has been appointed general manager. He has been succeeded as general manager of American-Fort Pitt Spring Div. by H. A. Harrington, former works manager.

Ford Motor Co., Lincoln-Mercury Div.—Charles S. Brown has been named general purchasing agent.

White Motors Co., Sterling Div.—Ernest R. Sternberg has been named general manager and J. P. Dragan has been appointed vice-president in charge of finance.

ACF-Brill Motors Co.—The following appointments have been announced: T. A. Duncan, vice-president—government contracts; C. F. Hoell, vice-president—finance and treasurer; F. W. Kateley, vice-president—engineering; Wm. Nelson, vice-president—Hall-Scott Div. and asst. to president; and C. A. Sharpe, vice-president—operations.



The B. F. Goodrich Rubber Co. of Canada, Ltd.—Ira G. Needles, vice-president, has been elected president.

The White Motor Co.—William G. Sternberg has been elected a vice-president in charge of the Sterling Div.



Fruehauf Trailer Co.—Frank Tully has been appointed manager of the Stainless Steel Div.

General Motors Corp., GMC Truck and Coach Div.—Thomas E. Wilson has been named production manager.

Fairchild Engine and Airplane Corp., Fairchild Aircraft Div.—The appointment of Charles F. Slick as works manager has been announced.

Twin Coach Co.—R. J. Sigafouo has been named chief engineer.

The Yale & Towne Manufacturing Co., Philadelphia Div.—John T. McCally has been promoted to assistant general manager, and Kenneth H. Bergstrom succeeds him as manager of production. Thomas W. Curtin has been appointed director of purchases.

E. I. du Pont de Nemours and Co., Inc.—Millard G. Gamble, III, assistant manager of "Cordura" rayon tire yarn sales, has been promoted to manager.

General Electric Co.—Dr. Martin A. Edwards has been appointed engineering manager of the company's general engineering laboratory. Elliott Harrington has been appointed vice-chairman and secretary of a newly-established defense projects and priorities committee of the company's Small and Medium Motor Divisions. R. S. Walsh

will head the Induction Motor Sales Div. D. S. MacDonald has been appointed sales manager of a newly-created gear motor section of the Gear Motor and Packaged Drive Div. of G-E's Small and Medium Motor Divisions. Francis K. McCune, of Richland, Wash., assistant general manager of the G-E's Nucleonics Dept., has been appointed manager of engineering of the company's Large Apparatus Div. in Schenectady, N. Y.

Canadair, Ltd.—The election of Vice Admiral Earle W. Mills, U.S.N. (ret.), and George W. Codrington as directors has been announced.

Canadian Raybestos Co., Ltd.—J. S. Munro has been named assistant general manager.

Kollsman Instrument Corp.—Alan G. Bannie has been appointed vice-president; Lowell H. Freye was named treasurer and Arthur Richenthal, secretary.

Cummins Engine Co., Inc.—William B. Lawrence, formerly regional manager for the Rocky Mountain Region with headquarters in Denver, Col., has been named general manager of the Cummins Diesel Sales Corp., with which two wholly-owned Cummins sales and service organizations, the Cummins Diesel Sales Corp. of Illinois and the Cummins Diesel Sales and Service of New York, Inc., have been merged.

Acushnet Process Co.—William J. Roemer has been elected purchasing agent, succeeding the late Frank A. Jepson.

Norton Co.—Robert D. Lawson has been named sales manager of the grinding machine division.

Necrology

Clifton High Carlisle, 81, founder of the Goodyear Tire and Rubber Co. in Canada, died July 27, in Toronto.

Roy Peed, 64, former vice-president and general sales manager of De Soto Div., Chrysler Corp., died Aug. 7 in Paris, France.

LaMotte Henry of the Lake City Malleable Co. died Aug. 2 in Toledo, O.

Instrument



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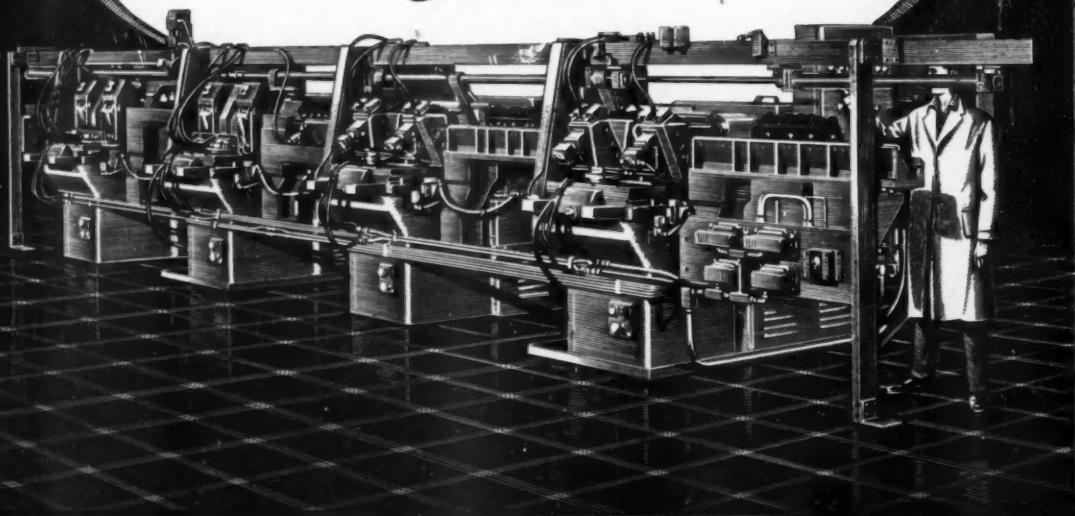


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MOST of the ones you think of first have bought New Britain Automatics within the past few years for new and better ways of doing important metalworking jobs. The New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Conn.

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LUCAS HORIZONTAL BORING, DRILLING AND MILLING MACHINES

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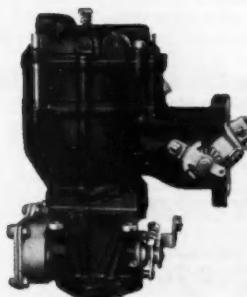
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No manufacturer could long exist in the competitive commercial vehicle field without drawing heavily on previous owners for new vehicle sales. It is perfectly obvious, no owner would buy the same make vehicle again and again unless it has delivered satisfactory performance. Therefore, it is just good business to see that every component contributes its share toward building owner loyalty. That's why manufacturers whose vehicles are Zenith* equipped measure carburetion costs in lasting terms rather than initial expense. In the field of heavy-duty carburetion, one name, Zenith, has stood for lasting satisfactory performance for over a quarter of a century. Zenith's rugged construction, strong idling, freedom from stalling and response to every demand make it the engineers' choice. For good will, it's good business to specify the best—Zenith for lasting performance.

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ANOTHER EXAMPLE OF MACHINING EFFICIENCY

39

3

3

21

3

23

1

92

CYLINDER BLOCK OPERATIONS IN AUTOMATIC CYCLE

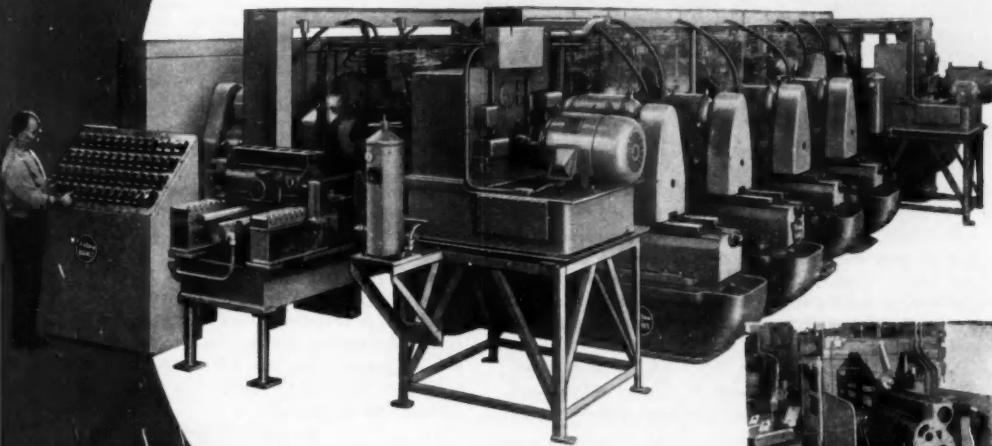
ON W.F. & JOHN BARNES

27-STATION "PROGRESS-THRU" MACHINE



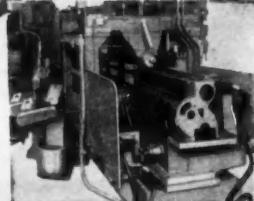
Two Cylinder Blocks
are machined front and
rear surfaces after machining
operations at each end are completed
in a total time of 34.5 seconds.

- At a gross production rate of 103 cylinder blocks per hour, this 27-station "Progress-Thru" Machine handles a total of 92 machining operations in both ends of the work pieces. Oil gallery holes, $17/32"$ in diameter, are drilled the full length of each block. To cut production time, the holes are progressively drilled in different stations by 13 separate heads. Prior to tapping, holes are automatically checked for depth by two opposed hydraulically-operated inspection units. Other features include hydraulic and electrical circuits built to J.I.C. Standards, individual operating controls between stations to speed tool changes, and a built-in chip conveyor. You can depend upon Barnes to give you the latest in cost-cutting ideas and machining techniques.



UNLOADING END ▶

Block has been turned 90-degrees to feed lengthwise into following machine. Compound angular heads at left, drill two $1/8"$ holes in the front end of block, after which block is turned 90 degrees.



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Latest Employed

By Joseph Geschelin

Attesting to the modernity of manufacturing facilities at Renault is this line-up of large Clearing presses in the body shop, featuring single-, double- and triple-action presses.

THE Renault Works—La Regie Nationale des Usines Renault—at Billancourt outside of Paris is one of the largest automotive establishments in Europe producing passenger cars, delivery vans, light and heavy trucks, farm tractors, and railcars. In addition to making engines for these vehicles, Renault also produces a wide variety of engines for industrial and marine uses.

Unlike similar plants in the USA, Renault must depend upon its own resources to a large extent, and produce its own steel, large castings and forgings,

paint, plastics, ball bearings, and Diesel fuel pumps. An extensive network of foundries at Billancourt produces castings of steel, iron, aluminum, bronzes, etc.

Early this fall the company is launching its new Frigate model (see AUTOMOTIVE INDUSTRIES, May 1) and there is feverish activity in the plant with preparations for tooling the new job completely. In addition, a new press shop and other facilities are in the process of erection to handle this model, all scheduled for opening in October.

The inside of the plant bears a striking resemblance to mass production plants in this country. Even the major part of the machine tools are familiar. Here are some names that ring the bell: Gleason generators and automatic Revacycle gear cutters; Bullard lathes; Gould & Eberhard gear hobs; Fellows gear shapers; Barber-Colman hobs; Landis, Norton, and Cincinnati grinders; Heald Bore-Matics and internal grinders; Kearney &



This is an example of a small transfer machine for drilling and tapping intake manifolds. The electrical control cabinets may be seen at the left.

American Methods by Renault in France

Here is a perspective of one of the older transfer machine lines which has been in operation for some time. It is used for various drilling operations on the cylinder block.

Trecker mills; Fay automatic lathes; Colonial broaching machines; and many more. In addition, they have a battery of five National Broach Red Ring gear shavers for shaving a variety of gears.

The plant is completely conveyorized, and features modern assembly conveyors, gravity roller systems, as well as monorail conveyors for feeding the assembly lines.

Despite its reliance upon the machine tool industry, Renault has won an enviable reputation for its success in designing and building intricate transfer machines, some of which have been in operation for a number of years. One example is the unit for machining cylinder blocks. This one has 22 heads and 59 tool spindles. Another transfer machine on the block—for drilling and tapping top and bottom surfaces—has six heads and 252 tool spindles. They also have a transfer machine for drilling oil holes in crankshafts.

Based upon this extensive background of experience and profiting by surveys in the USA, Renault recently embarked on the development of a new line of transfer machines for the Frigate line. One basic difference in their transfer machines is found in an emphasis on mechanical-electrical controls and the exclusion of hydraulics and electronics. In addition, they have settled on a group of three standard units from which



are built up the various transfer lines. These units are made in sizes of 1½, five, and 15 hp rating, the smaller units having a stroke adjustable to 12 in., while the 15 hp unit has a stroke up to 16 in. In addition, they have a standard milling unit with eight-hp motor drive.

The new transfer machines for the Frigate model are larger and more massive, and longer than the earlier types. Moreover, the individual machines tied into the transfer line are made up of heavy welded steel frames instead of cast iron bases and frames. In general, the adoption of standardized units makes it possible to salvage most of the equipment cost in the event of a major changeover.

As an example of the new treatment, one of the larger units for the cylinder block runs 180 ft in length and boasts 34 individual stations. Another feature of the new machine shop is the installation of a chip conveyor in the floor to handle chips from all machines in the department.

France as well as England enjoys a plentitude of aluminum and manufacturers are free to use it
(Turn to page 102, please)

Supersonic Rocket Tested at Secret

By Robert McLaren

SOME of the most important aeronautical research information ever obtained has been produced on a barren little island off the Eastern Shore of Virginia that, until six years ago, was known only to the members of an exclusive gun club. Wallops Island is the desolate Atlantic Ocean site of the Pilotless Aircraft Research Station of the National Advisory Committee for Aeronautics. It is the only firing station in the world for rocket-powered pilotless research missiles, which are heavily instrumented for scientific research. Many of its results have already accounted for the unprecedented performance of late model jet and rocket combat and piloted research airplanes.

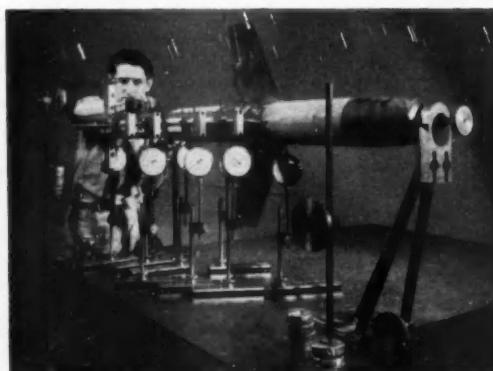
Wallops Island's chance for fame came late in World War II when aircraft speeds were well into the transonic zone and research, performance, was being pushed high into the supersonic regime. The NACA Langley Aeronautical Laboratory, across the Bay at Langley Air Force Base, Va., was operating amazing wind tunnel equipment capable of providing test streams well into the supersonic region at a variety of simulated altitudes and scales. However, like researchers the world over, including the German wind tunnel experts, the NACA had virtually abandoned any hope of producing an air-stream of exactly sonic speed (Mach number 1.0) in a wind tunnel due to the well-known "choking" effect with resulting shock wave reflections between the model and the tunnel walls. (This problem has only been solved in the past few months by NACA research-

ers but their methods are highly-classified military secrets—Ed.)

The only solution to the problem was to go outside the wind tunnel into free flight tests, where Mach 1.0 or any combination of speed and air density can be obtained. The first method used (and one still very much in use) was to carry a heavy, streamlined bomb mounting tiny wing shapes in its nose to an altitude of 30,000 ft and let it go. The bomb then nosed earthwards and began to accelerate, striking the ground at supersonic speed. During its drop it obviously passed smoothly through the exact speed of sound and a combination of radar tracking and telemetering produced data on the lift and drag of the tiny surface being tested. Since this is not exactly the sort of thing you'd like passing through your house, the NACA obtained the desolate seven mile x three-and-a-half-mile expanse of Wallops Island for its target. Radar equipment was installed, a few concrete buildings erected and a surplus Boeing B-29 bomber obtained as a carrier.

While this "bomb-drop" method proved extremely useful for obtaining scientific data through the transonic speed region, it had several drawbacks. Since the test began at slow speed at high altitude and proceeded to a high speed at low altitude, it created conditions exactly the reverse of a missile launching and the test proceeds at progressively increasing Reynolds number, which indicates scale effect, instead of the decreasing Reynolds number desired. The great weight of the test body, necessary to

Installation of loading and measuring devices for determination of torsional rigidity of wing on rocket-powered, lateral-control research model.



Missiles Station



A delta-wing rocket-powered research model is prepared for launching. Models such as this are used to obtain aerodynamic data on wing shapes, stability, control effectiveness, and other factors involved in designing high speed aircraft.

produce rapid acceleration in the dive, prevented tests of control surface motion and resulting gyration of the model needed for stability and control tests.

Robert R. Gilruth, chief of the Pilotless Aircraft Research Division of the NACA Langley laboratory, therefore turned to rocket-powered models for the experiments through the transonic zone, since they can duplicate to exact scale the action of a guided missile from takeoff to ground contact. This decision has proved foresighted for in the ensuing five years the results obtained from such models have far exceeded even the most optimistic hopes and this research method, originally developed as a stop-gap means, is now a full-fledged partner of the wind tunnel with a permanent future usefulness in aeronautical research. It has already provided the data for design of the Republic XF-91 Thunderceptor, the Convair XF-92A delta-wing fighter, the new Douglas XF4D-1 delta-wing carrier fighter and the series of Bell X-2, Douglas X-3 and Douglas D-558-II Skyrocket research airplanes.

It was early decided to make the models expendable for several reasons. Firstly, for the kind of fundamental research in which the PARD (Pilotless Aircraft Research Division) is engaged, it is much more important to gather a wide range of data using a large number of comparatively simple models than a much more narrow range of data using fewer complicated models. Secondly, in order to recover the models, each of them would have to be equipped with drag flaps, a recovery parachute and timing mechanism for the operation of both. Since each of the models is different than the others, this means that this equipment would have to be especially designed and built for each model. Last—and most obvious—is the time-taking "fishing expedition" that would be required to locate and salvage the models.

The PARD is not engaged in guided missile research or in the testing of guided missiles, such as is conducted by development centers concerned with the problem of testing and improving actual combat articles. Instead, the work at Wallops Island is pure scientific research, the results of which are applicable to

all missiles and high speed aircraft. On this score it is the only known installation of its kind in the world.

The use of rocket-powered models does not, in any way, duplicate the use of high speed wind tunnels. It is actually a link between the wind tunnel and the final, completed aircraft or missile. Firstly, it permits the testing of aerodynamic shapes in combinations of Mach number and Reynolds number not available in the wind tunnel. Secondly, the rocket models operate in the free atmosphere where there is no turbulence, there is no support interference and there is no limitations on the flow field requiring wall corrections, velocity gradients, etc. Thirdly, the model is free to oscillate, rotate, pitch or even spin according to its degree of stability, which cannot be duplicated in a wind tunnel. The use of scale models of the future aircraft in free flight provides the designer with much more applicable data peculiar to his own design. It is this niche in the progression from research to final airplane that rocket-powered models seem destined to fill for many years to come.

The models vary in length from six to 10 ft and weigh anywhere from 75 to 250 lb. They are powered by standard Army-Navy 3½-in. and five-in. high velocity aircraft rockets, such as are mounted under the wings of fighters and attack planes in Korea today. These rockets burn the standard solid fuel made up of nitrocellulose and nitroglycerine. The five-in. HVAR produces 6000 lb of thrust and it is little wonder, therefore, that the models take off with an acceleration of 50g and reach Mach number 1.4 in just three seconds.

The models are designed and built in the PARD

Supersonic Rocket Missiles Tested

shops at the Langley laboratory and are shipped over to the Island for final assembly, test and firing. The data obtained are returned to the Laboratory for analysis so that the station is simply a service activity for the Division and is not literally a research function. The models require from one to six months to design and build yet their flight is over in 15-20 seconds and they are reduced to bits and pieces when they hit the water.

The models used run the complete gamut of shapes and sizes of all the various aircraft and missile configurations yet conceived. Obviously, the shape of the model depends wholly on the nature of the test. However, most of the models consist of a long, cylindrical body housing the sustainer rocket. The pointed nose of the model contains the telemetering equipment, the central portion, the research instrumentation and operating mechanisms for control surfaces, and the aft portion the rocket motor. A variety of combinations of power are used. Typical is the combination of a sustainer rocket in the body of the model and a booster rocket mounted behind the tail. However, two or three booster rockets may be clustered, the model may use only its own sustainer rocket for takeoff or it may contain no sustainer rocket and make its flight entirely on the initial kick provided by a booster rocket.

After the booster rocket has completed firing, usually about three seconds, the drop-off of its thrust



Radar operator loads a motion picture camera as he prepares to track a rocket propelled model in flight.

and its high drag created by its heavy tail fins, causes it to separate from the model and drop into the ocean close off-shore. Several systems for operation of the sustainer rocket may then be used: the sustainer may start firing a fraction of a second before the booster is dropped, it may start firing a few seconds after the booster has cleared, or it may be delayed for as long as 10-15 seconds before the igniter fires. This long-delay firing system is used when it is desired that the model coast to high altitudes before accelerating again. Altitudes as high as 100,000 ft are often obtained and the models coast from 10 to 20 miles out to sea. Obviously, a model test presents little for the spectator to see for after the initial firing of the booster the rocket streaks skyward out of sight in one second and he is left with only the amplified ticking of the timing signals, which are broadcast throughout the island, as a reminder that the test is still on.

Immediately after a launching a radiosonde balloon is released and the variation of temperature and pressure with altitude is telemetered to the ground and recorded. This is an essential part of the test since Mach number depends on the ambient temperature and drag depends on density of the atmosphere.

The whole function of these dramatic rocket firings is to obtain data on aerodynamic phenomena at transonic speed. Each of these firings



This continuous wave Doppler velocity radar unit provides a running record of the speed of rocket-powered models.

is simply a means of obtaining a high speed flow of air across the wing surfaces of the model. The rocket is used to accelerate the model to these speeds and the whole activity centers about the model as a test vehicle rather than a test of the model itself, as is the case at other rocket stations. In order to obtain the required data from these colorful firings, a variety of equipment is used.

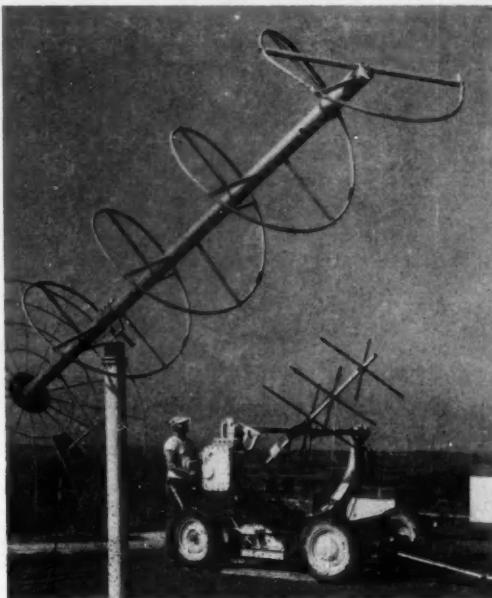
Firstly, the exact speed of the model must be known throughout its flight. This speed recording is obtained by the use of a Sperry Velocimeter, a Doppler radar unit of which only five have been built and two are in use by PARD.

The next problem is to know the height of the model at each instant of its flight, which is needed to calculate its Mach number. This is obtained by a conventional SCR-584 pulse radar set, the signals from which are fed to an automatic plotting board. This board provides two ordinates: the "XY" plot, which gives the model's position in a horizontal plane, and the altitude plot. A combination of these two plots, although recorded on a flat sheet by ink stylus, gives the model's position in space at each instant of its flight. Thus, this reading can also provide data on the speed of the model and it is used as a check on the Doppler radar data.

The combination of the Doppler radar, the pulse radar and the radiosonde measurements provide the basic data on the flight against which all the various other measurements are to be plotted. For a pure drag test, these measurements alone suffice since the weight of the model and its thrust are known precisely. Therefore, the course of the model assuming no drag can be plotted. The extent to which the test model drops behind this schedule is an index to its drag and the drag coefficient of any model may be obtained using only these basic measurements.

But much more complex research data are needed than simple lift and drag, although these are basic quantities indeed. The remainder of the data are obtained by telemetering the information from the model in flight to automatic receiving and recording equipment on the ground. The 10-channel telemetering equipment is designed and fabricated entirely by NACA personnel. One test may require the use of only two channels, another as many as 20 or 30 through the use of multiplexing circuits, although these are rarely used because of the small size of the models.

Telemetering is simply a very fancy name for ordinary radio, the principles being identical. The various items to be measured are designed to function in such a manner that they change the frequency of an oscillator. This signal is then amplified and used to amplitude modulate the high-frequency carrier. The secret of telemetering lies in the ingenuity used in the methods for converting pressures, angles and accelerations into electrical signals and in the design of miniature components. Antennae are not used in



Specially-designed radio antennas on roof of control building at Wallops Island. They are used to receive data telemetered from research models launched at the station.

the model, instead the signals are fed into a two-turn coil wrapped around a plastic form.

One ingenious exception to this system is the spinsonde used to measure the rate-of-roll of a model. The sustainer rocket exhaust is expanded through four offset nozzles which roll the model at high velocities. The antenna sends out a polarized signal and the receiving station on the ground picks up a remarkably-defined signal each time the plane of polarization crosses the receiving antenna.

In the most complicated models used, the following data are telemetered to the ground: a base time signal (1/10th second intervals, adjustable as desired), model lift, model drag, control effectiveness, hinge moment, damping in roll, initial performance (for ram-jet powered models), flutter, boundary layer phenomena, automatic stabilization, stability and flying qualities. These terms are simplifications of the actual parameters telemetered, which include such terms as yawing moment due to roll, increment of pitching moment coefficient about the quarter-chord, etc.

Stability and control tests, the most complicated used, center about a programmed elevator motion. In this kind of test, the elevator is driven by a tiny hydraulic motor so that it deflects upward, hesitates, then returns to neutral at regular short intervals during the flight. Naturally, the model pitches up and oscillates to a steady-state, pitches back down and oscillates to a new steady-state each cycle. It is the

(Turn to page 100, please)



On the torque converter assembly line, the impeller is set in a fixture on the work-table height conveyor and the remaining converter sub-assemblies are installed at various stations along the line. Here the turbine is about to be inserted.

Assembling and Testing Automatic Transmissions

At Rate of One

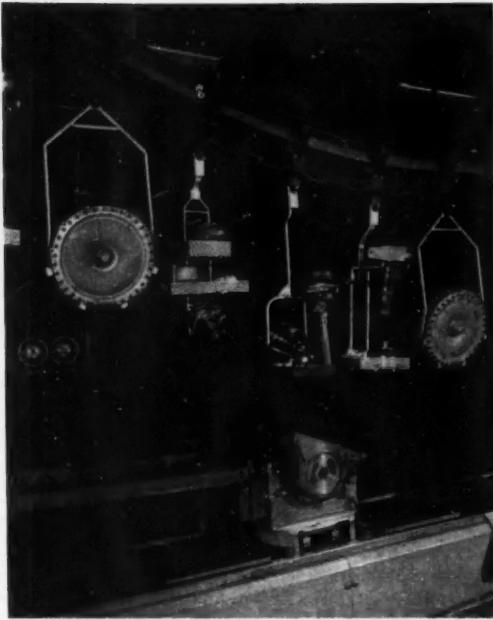
This Article Is the Third of a Series on the Manufacture of the Ford-Mercury Units, the Previous Articles Having Been Published in the July 15 and August 1 Issues of AUTOMOTIVE INDUSTRIES

A battery of Merc testing machines is used to test the transmissions before final acceptance. Each machine is capable of giving a properly functioning transmission a simulated road test in a period of five minutes.



FORDOMATIC and Merc-O-Matic transmissions are assembled and tested at a rate of one per minute in a pressurized air-conditioned room at the Cincinnati plant of the Ford Motor Co. Automatic Transmission Division. Complete utilization is made of overhead and table height conveyors, various other materials handling equipment, up-to-date testing apparatus, quality portable tools, and special fixtures necessary for mass production of the complex units.

Since some portions of the transmissions are so sensitive in operation, utmost cleanliness is stringently



Four different types of hangers are used on the overhead conveyor at the final assembly line. The transmission case, cradled in a fixture, travels along the worktable height conveyor for the various assembly steps.

Per Minute

By
Thomas MacNew

stressed. All parts are washed before entering the assembly department and over 50 per cent of them are washed again after entering to remove foreign matter which may have gathered on the parts in transit.

In addition to operations in the air-conditioned enclosure, some sub-assembly work is carried out in the machine shop. Major sub-assemblies made up in the shop are the turbine, stator, and pump. Each of these requires at least one machine operation.

In the case of the turbine, the ears of 33 blades have to be turned down against the shell and inner shroud and then the hub is riveted in place. This unit is then balanced.

For the die cast aluminum stator, a welded steel band is secured to its periphery, the one way clutch

Oil Pressures in Valves

At Various Throttle Openings and Transmission Ranges

Range	Throttle Opening (deg)	Input Rpm	Line Pressure (psi)	Front Clutch (psi)	Rear Clutch (psi)	Front Servo Apply (psi)	Front Servo Release (psi)	Rear Servo (psi)
Reverse	3	0	80	0	80	0	80	30
Reverse	20	0	150	0	150	0	150	150
Neutral	3	0	80	0	0	0	0	0
Neutral	20	0	125	0	0	0	0	0
Low	3	0	80	80	0	0	0	30
Low	20	0	150	150	0	0	0	150
Drive 2nd	3	0	80	80	0	50	0	0
Drive 2nd	20	0	125	125	0	125	0	0
Drive 2nd	3	1500	80	80	0	50	0	0
Drive 2nd	20	1500	80	80	0	50	0	0
Drive 3rd	3	1500	80	80	80	50	50	0
Drive 3rd	20	1500	80	80	80	50	50	0

unit is installed, and the complete unit is balanced.

The 31 blades of the impeller are fastened to the impeller housing and shroud by turning down the ears of the blades and with the use of a ring-lock.

These units then proceed along the main overhead shop conveyor to the final assembly area. There, along with the cover assembly which includes the starter ring gear, the three major elements are combined to make up the torque converter.

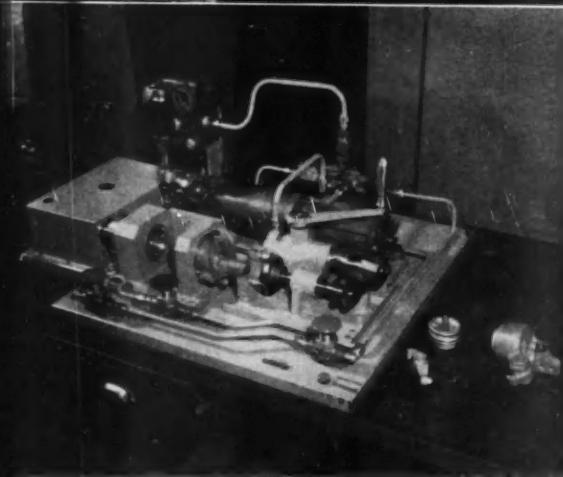
This operation is performed on a worktable height conveyor equipped with special fixtures. The impeller assembly is slipped into the fixture and the remaining sub-assemblies are installed in proper order, thus completing an important segment of the final unit.

In another section of the air-conditioned enclosure, the sensitive apparatus which controls operation of the transmission—main control body—is progressively assembled. Consisting of about 90 separate pieces, this precision-made unit is probably the most complex portion of the entire torque converter-transmission assembly.

Extreme care is taken during the course of assembly steps to make certain that all parts are free of burrs or chips so that valves will not stick during operation. Valves are inspected for raised edges on their ground diameters. Valve bodies are checked for porosity above certain accepted limits. Inspection is also performed on valve body parts for nicks or gouges which might affect the unit. During the course of events, the parts are thoroughly cleaned for even a minute particle of foreign material might render the unit inoperative.

Finally, for an absolute check, each main control assembly is thoroughly and accurately tested in a special machine made for Ford by Merz Engineering, Inc. A battery of these machines is employed for this work. This is probably the most interesting assembly room operation on the main control unit.

The Merz machines have a special fixture that holds



the main control with a force equivalent to the transmission mounting and in such a manner that certain oil lines match up with the control. One line leads from the front clutch hole to a pressure gage and pressure switch, and to the input pressure port of the governor. Lines from the rear clutch hole and rear servo hole lead to pressure gages and pressure switches. Another oil line runs from the governor hole to a pressure gage.

A relief on the mounting face of the control, corresponding with the rear pump opening on the separating plate, is provided to vent any leakage by the rear pump check valve.

Oil used for testing is M-2C2 torque fluid and it is delivered at a rate of 10 gpm at 200 psi. The test unit has a special heating unit capable of maintaining an oil temperature of 140 F and the equivalent viscosity of transmission oil at 200 F. Since dirt is so critical, filters are provided to remove particles 0.0005-in. diam and larger.

Oil pressures in the various valves at different throttle openings and transmission ranges are given in the accompanying table.

Each unit is tested according to a shift pattern, and the assembly must have certain shift characteristics, as well as having the oil pressures shown in the table, in order to pass.

Of course, there are many other sub-assemblies which make up the finished component and these are assembled in various stages throughout the special enclosed area. Most of the units so assembled are conveyed to the final line on an overhead conveyor carrying special hangers designed for certain parts. Electric trucks are used to bring in some of the heavier sub-assemblies, such as the transmission case and converter housing. To handle these units on the final assembly line, electric hoists are utilized.

Along the final line, the first component received is the transmission case. This is placed in a special fixture that can be rotated on the conveyor bed. Operations along the multi-station line progress at a rate keyed to the movement of the worktable height conveyor.

Successive operations, after the transmission case is put in place, include the installation of transmission levers, a throttle lever, a toggle, and a parking pawl. Next the case receives the front and rear clutch, the front band, a center

(Turn to page 94, please)

(Top)—Operations at this station include assembly of the output shaft, rear pump, governor, distributor, and speedometer gear into one unit.

(Center)—An Airdraulic fixture is used for the assembly of the transmission's forward gear and tube assembly.

(Bottom)—This fixture is used to assemble the Ford automatic transmission front servo. Component parts are at the right.

Speeds up to 800 MPH at 1951 National Air Races

THE automobile city of Detroit became the aviation city of the nation during the week of August 13-19, designated Michigan Aviation Week. On the 18th and 19th it played host to the National Air Races, renewed after a one-year lapse of uncertainty regarding the future of the 25-year-old classic.

Star of the event was the North American F-86E Sabre jet fighter, which demonstrated its ability to toy with world's speed records, its marks being determined only by the whim of the pilot. This was borne out when Maj. Michael C. Horgan of the Air Proving Ground, calmly pushed his Sabre-jet past sonic speed in a high altitude dive while brother officers in speed dashes near the ground played with mere 600 mph speeds. It was Maj. Horgan's daily demonstration of the "supersonic boom" that stole the show for the technically-minded present. Starting a vertical dive from 50,000 ft, Maj. Horgan attained supersonic speed quickly and began a pull-out at about 35,000 ft. After an interminable delay (about 35 seconds) the crowd was rocked by two sharp, loud explosions; the Sabre's shock wave striking the ground. Reports of this phenomenon have been so often as to be no longer newsworthy in the technical press but scientific explanations still run a gamut of spec-

By Robert McLaren

ulation and bafflement. This was the first time that a large public audience had been present for such a demonstration and it portends the day when aerial combat over cities—even at 50,000 ft—will be a noisy demonstration of "supersonic booms" crackling through the air.

This visible evidence of the speed capability of the Sabre robbed its new level-flight speed records of some of their glamour, for it demonstrated clearly that the pilots were flying well within the capability of the airplane and were under instructions to raise existing records by only a slight margin. Thus, the performance of Col. Fred A. Ascari, director of Experimental Flight Test and Engineering, Edwards Air Force Base, Calif., in establishing a new world speed record for 100 kilometers (62.14 miles) of 635.411 mph, while returning this record to the U.S. after a lapse of many years, proved that the Sabre was merely toying under a restraining throttle. Somewhat nearer the mark was the (Cont'd., page 110)

Bendix Trophy Race

Edwards AFB, Calif. to Wayne-Major Airport, Detroit, 1810.5 miles

Name	Plane	Time	Speed
1. Col. K. K. Campbell	N. Amer. F-86E	3:27:56.4	663.761 mph
2. Col. E. S. Davis	Republic F-84E	3:35:17.0	534.847 mph
3. Lt. Col. G. B. Thibault	N. Amer. F-86C	3:38:11.2	532.637 mph

Allison Trophy Race

Wayne-Major Airport to Indianapolis, Ind., and return, 430 miles

1. Lt. W. D. Baisley	Republic F-84E	44:33.67	660.812 mph
2. Lt. Col. W. E. Bertram	Republic F-84E	45:38.04	668.384 mph
3. Lt. Jacob Kraft, Jr.	Republic F-84E	50:02.34	516.992 mph

Thompson Trophy Race

100 km (62.14 miles) closed course

Col. F. A. Ascari, only participant, averaged 635.411 mph on August 17, 1951 and 628.066 mph on August 19, 1951. First speed will be submitted to F. A. I. as claim to official world's speed record for the distance.

Continental Motors Trophy Race

15 laps of 2½-mile course: 37½ miles

1. John P. Jones	"Sheesring"	187.218 mph
2. S. J. Wittman	Wittman Sp.	182.174 mph
3. Keith Sorenson	"Little Mike"	187.478 mph
4. Wm. Brennan	Wittman Sp.	184.382 mph

Chicago-Detroit Speed Dash

Four North American F-86E Sabre jet fighters, led by Capt. Omer J. Reichman and including Capt. Frederick J. Blaauw, Capt. Liles J. Brooks and Lieut. Jack C. Lewis, covered the 237-mile course in formation in 20 min., 58.02 sec. to average 672.160 mph.



Two Navy aircraft upon which hot spray lacquer application is anticipated. They are the AD Skyraider (above) and the F3D Skyknight (right).



Hot Spraying Of Lacquer Feasible For Aircraft

HOT spray application of organic finishes is not new but it is only recently that a concerted effort has been made to adapt this process to the needs of the aircraft industry. Although the process is being improved upon, it has been developed to an economical and satisfactory workable stage. Some of the results of using this process at the Douglas El Segundo Division, in coordination with the Navy Bureau of Aeronautics, are described here.

How Savings Are Made

Perhaps the most obvious although not the greatest saving is by the use of less solvent. Hot spraying makes this possible by using heat to lower the viscosity of the lacquer instead of using thinners. Thus, the spray operator is able to apply a higher solids film with less

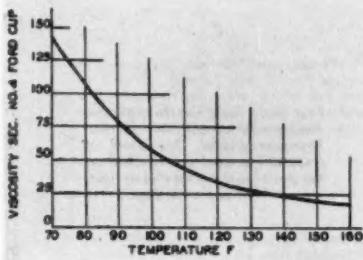
By E. D. Mitchell and O. J. Winkles,
Process Engineering Department,
El Segundo Div., Douglas Aircraft Co.

material loss due to fog and overspray. This also enables the operator to apply a given film thickness in fewer coats because he is applying solid materials instead of solvents which must be subsequently evaporated.

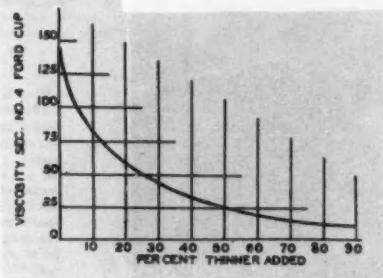
For hot application $2\frac{1}{2}$ parts of thinner to three parts of package material are used at Douglas El Segundo, while for cold spraying the ratio is five parts of thinner to four parts of package material. Since



Application of aircraft finish by the hot spray method.



(Chart, left)—Effect of heat on viscosity of a 52L26 lacquer.



(Chart, below)—Effect of thinner on viscosity of a 52L26 lacquer.

the thinner serves only as a carrier for the solid material and is totally lost through evaporation, the hot spray method means a saving of almost 50 per cent of thinner. In addition there is loss of lacquer through greater overspray and more fogging of the lighter material. Two wet cross coats applied cold yield a dried film thickness of approximately 1.5 mils. An equivalent dried film can be obtained by hot spraying one wet cross coat. This eliminates all sanding required

application has an inherent tendency to encourage heavy films.

The hot finish has less tendency to sag. Lacquer thinned for hot spraying, with a correspondingly higher solids content and faster drying characteristics, has less tendency to sag than the same lacquer thinned for spraying at room temperature. A hot film twice as thick as a cold film tends less to sag.

(Turn to page 106, please)

between cold coats. Hot spraying effects savings in thinner, lacquer, spraying time and sanding.

Indirect savings are made by increased production with present equipment. It is estimated that production with present equipment will be doubled by using hot spray application. Hot sprayed lacquer dries much faster than cold applications. A hot sprayed film will dry dust free in five to ten minutes. This fast drying saves rejects and subsequent sanding and touchup to remove foreign particles picked up in the wet film.

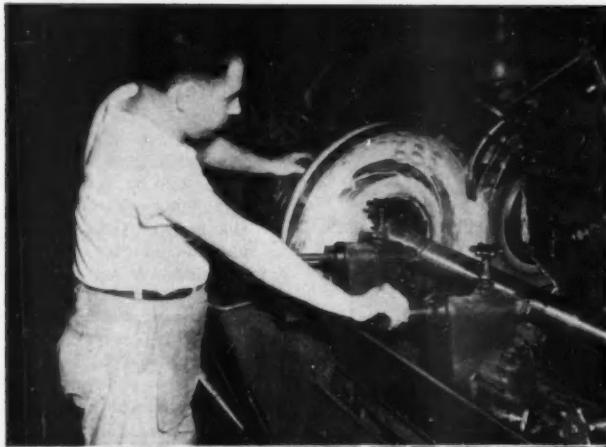
Better Quality

All tests conducted at Douglas Aircraft Co. prove a hot sprayed film to be equal to or better than a cold sprayed film. In no test has the cold application proved superior. Perhaps the greatest factor in making a hot sprayed film better than a cold sprayed film is the lower percentage of solvent which must be driven off in drying. This produces a less porous film which is more resistant to penetration by moisture of oil. Film shrinkage is reduced and small surface imperfections are covered better.

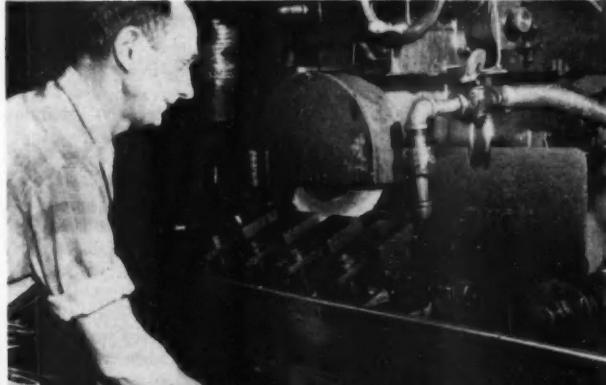
The hot finish has better flow out. All evidence indicates that a heavy film has better flow characteristics than a light film. The higher solids content of lacquer thinned for hot

Production Highlights

Turbine



The turbine wheel and shaft of a General Electric J-47 engine get all but a few steps of finish grinding on this machine. In a 214-min operation cycle, the wheel and shaft are ground on a Cincinnati grinder with a hand feed. Bearing diameters on the shaft get an added finishing in a later operation.



Four blade roots for the J-47 are finish-ground at one time by this Thompson grinder. The wheel is frequently dressed and checked on the master patterns located at right and left of the carriage.



Using a Warner & Swasey turret lathe, the weld joining the inner wheel and the outer, or "hot" rim is exposed and faced. Spindle speed is 27 rpm and feed is 0.012 in. per revolution, using a cam attachment. Two passes are made on each face of the wheel with the tool crossing three types of metal: the inner wheel, the weld, and the outer rim. Inner wheel and shaft are AMS 6415, the weld rod used is AISI type 312, and the outer rim is Timken 16-25-6.

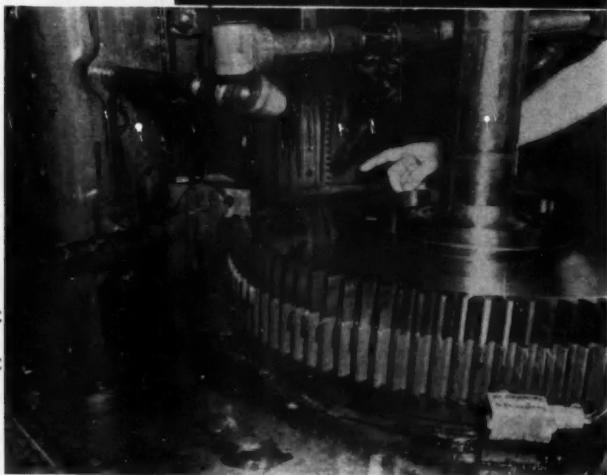
in Making Parts

MANY Major Components of the General Electric Co. J-47 Turbojet Engine are being produced by Wright Aeronautical Corp. under a subcontract agreement with GE. Illustrations shown here depict some of the interesting operations carried on at the Wright, Wood-Ridge, N. J., plant.

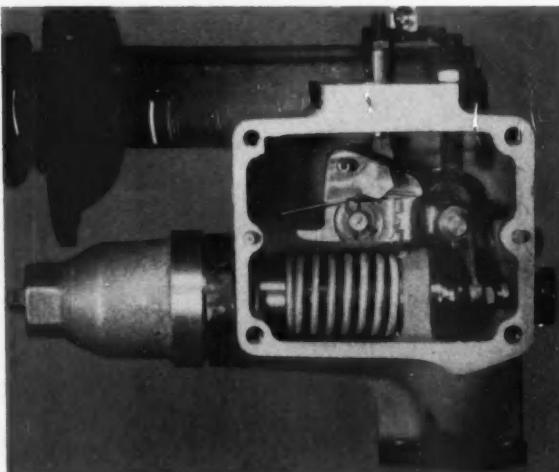
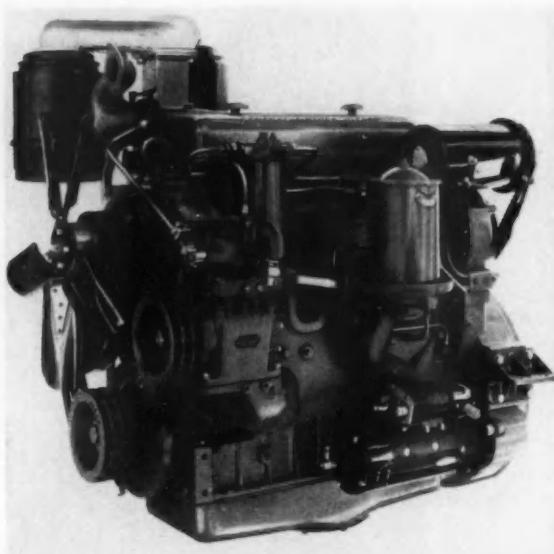
The outer rim and the inner-shaft-wheel are joined by welding. Heated parts revolve on a table which is gas-heated, and seven passes are made on each side of the wheel by two welders who keep a continuous bead laid on each pass.

The 11-stage compressor of the General Electric J-47 turbojet is attached to the shaft by shrink-fitting. Nine forward wheels, of aluminum alloy, are heated to 300 F and the three steel rear wheels are brought to a temperature of 800 F before being pressed onto the shaft as shown.

A Cincinnati broach is used for finishing the 96 bucket serrations on the turbine wheel. Speed of the broach is 12 fpm and operation cycle is 130 min. A matching support plate is shown in position under the wheel.



Latest Improvements in GM Two-Stroke Diesels



RADICAL improvements in the familiar GM 4-71 and 6-71 two-stroke Diesel engines, designed to boost power ratings, boost economy and performance, and reduce maintenance costs have been announced by GMC Truck & Coach Division, General Motors Corporation. To be known as the "Million-Milers" the new 4-71 engines will be standard equipment on Series 650, 740 and 750 models, while the 6-71 will be installed in Models 900 and up.

As outlined in the table, engine output has been increased significantly. In addition, governed speed has been upped to 2100 rpm, from the previous figure of 2000 rpm. Naturally the weight/bhp ratio has been reduced correspondingly to the advantage of economical operation.

1951 GMC 4-71 and 6-71 Diesel Engines Comparative Performance Data

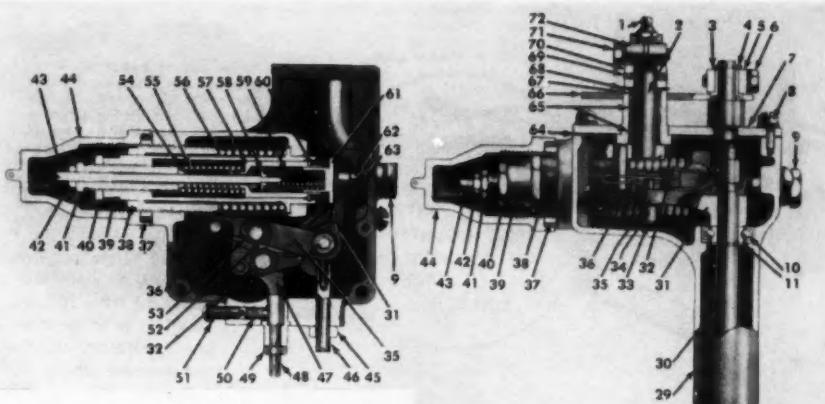
Model	4-71			6-71		
Year	1945	1950	1951*	1945	1950	1951*
Bhp (max.)	110	113	150	165	200	225
Bhp (net)	96	118.5	134	148.5	184.5	208
Wt. per bhp (lb.)			9.8			9

* Governed speed 2100 rpm; formerly 2000 rpm.

To achieve these major results, GMC has incorporated a number of detail changes. One of the basic items is the introduction of a Fuel Modulator, a device designed to control the amount

View of new GMC Diesel engine with accessories installed.

Looking at the top of the governor assembly the spring-actuated control of fuel modulator action.



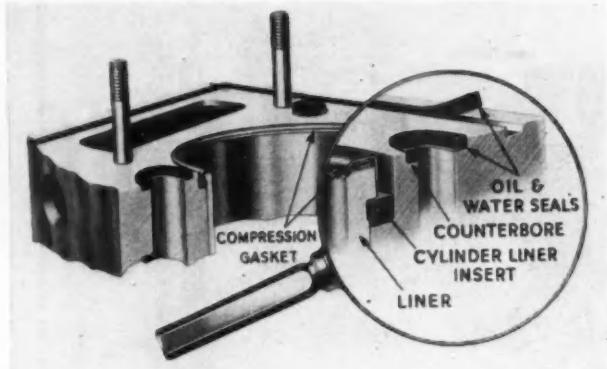
- 1 Lubrication Fitting
 2 Throttle shaft
 3 Washer
 4 Clip Pin
 5 Stop Lever
 6 Cap Screw
 7 Control Housing Cover
 8 Cap Screw
 9 Housing Plug
 10 Ball Bearing
 11 Washer
 12 End Cap
 13 Retaining Screw
 14 Screw Lock
 15 Gasket
 16 Ball Bearing
 17 Operating Fork
 18 Thrust Bearing
 19 Riser
 20 Weight Shaft
 21 Weight Housing
 22 High Speed Weights
 23 Needle Bearings
 24 Weight Pin
 25 Weight Carrier
 26 Weight Pin
 27 Set Screw
 28 Low Speed Weights
 29 Control Housing
 30 Operating Shaft
 31 Operating Lever
 32 Torsion Spring Screw
 33 Roller Pin
 34 Roller
 35 Differential Lever
 36 Torsion Spring
 37 High Speed Loc Nut
 38 High Speed Adjusting Screw

Cutaway views of the fuel modulator and governor assembly

- 39 High Speed Spring Plunger
 40 Modulating Screw Lock Nut
 41 Modulating Speed Adjusting Screw
 42 Idle Speed Screw Lock Nut
 43 Idle Speed Adjusting Screw
 44 Adjustment Cover
 45 Buffer Screw Lock Nut
 46 Buffer Screw
 47 Modulating Cam
 48 Cam Adjusting Screw
 49 Screw Lock Nut
 50 Cam Lock Screw
 51 Plugging Screw
 52 Clip Pin
 53 Washer
 54 Modulating Spring Seat
 55 Modulating Spring
 56 High Speed Spring
 57 Modulating Spring Plunger
 58 Low Speed Spring Seat
 59 Low Speed Spring
 60 Retainer Ring
 61 Low Speed Spring Cap
 62 Lock Nut
 63 Low Speed Gap Adjusting Screw
 64 Cover Gasket
 65 Roller Bearings
 66 Control Cam
 67 Seal
 68 Seal Washer
 69 Taper Pin
 70 Control Lever
 71 Cap Screw
 72 Throttle Lever

of fuel injected into the cylinders at speeds below 1500 rpm. By preventing an excess of fuel under low speed conditions when blower output is reduced, the Fuel Modulator is said to improve fuel economy and to aid in reducing smoke and engine deposits. As shown in the cutaway illustration, this control is incorporated with the mechanical governor mechanism. Control of fuel regulation is said to be assured regardless of throttle setting maintained by operator.

The governor includes a low speed spring, a high speed spring, a set of low speed weights, and a set of high speed weights, similar to those included in a speed limiting mechanical governor. In addition, the governor incorporating the Fuel Modulator includes a fuel modulator spring (55) which provides governor control for the purpose of cutting back the fuel in the speed range of 600 to 1800 rpm full load. Over this speed range the forces of the low speed and modu-



Partial cutaway section at the top of the cylinder liner gives detail of the steel spacer and the Belleville type sealing ring over the top surface of the liner. Also shown are some of the oil and water seals.

lator springs react against forces of high speed weights.

As the engine speed decreases below 1800 rpm, the gradual reduction in high speed weight force permits the force of the low speed (59) and modulating spring (55) to open the fuel modulator gap in the governor by moving the low speed spring cap (61) back away from the high speed spring plunger (39). The movement of the low speed spring cap (61) moves the operating lever (31)—and the operating lever carries the differential lever (35) toward the engine, causing the differential lever to rotate around the pin which connects it to the operating lever. The rotation of the differential lever is restricted by the engagement of the roller (34) on the bottom of the lever, with the fuel modulator cam (47). The cam causes the differential lever to rotate in a direction which pulls the governor link back into the governor and thus pulls the injector racks out from the full fuel position.

During this time the differential lever torsion spring (36) opposes the above rotation with a light tension and maintains the roller (34) in its proper position against the fuel modulator cam (47). It is this differential lever torsion spring which allows the Fuel-Modulator to operate regardless of the throttle position maintained by the operator.

With the improved governor control, injector capacity has been increased from 70 cu mm to 80 cu mm.

An improvement of some six per cent in fuel economy at speeds above 1500 rpm is

effected by the new camshaft which holds valves open for 170 deg as compared with 160 deg. The overall effect is to improve scavenging and breathing, up fuel economy, and decrease smoke.

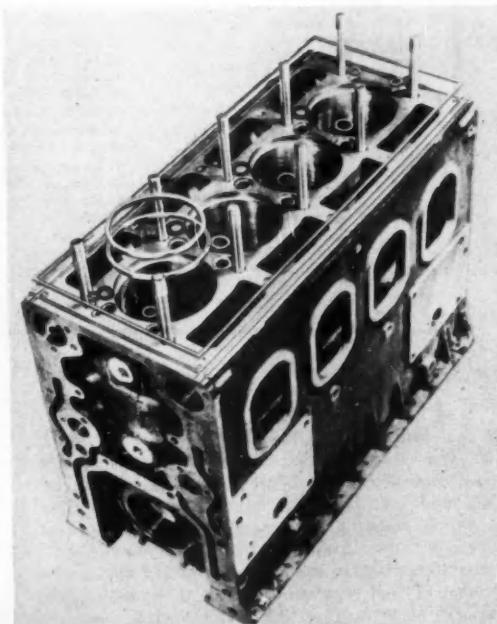
Greater life and freedom from the usual maintenance problems are said to be imparted by a long

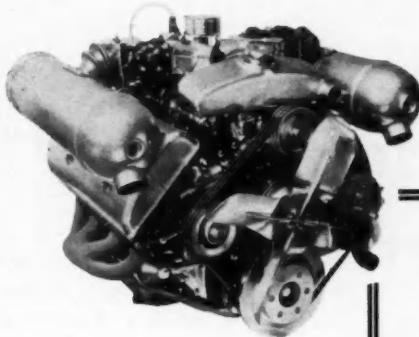
list of design improvements. For one thing the cylinder head gasket has been eliminated by grinding the mating faces of cylinder heads and block. The cylinder head is more rigid and less subject to deflection through increased wall thickness and development of heavier ribs and struts. Similarly, the cylinder block has heavier walls, heavier top deck, and stud bosses extended downward with longer thread engagement.

With the elimination of the gasket, GMC provides synthetic rubber rings and strip gaskets to seal water and oil openings.

(Turn to page 92, please.)

Perspective view illustrating the variety of rings, gaskets, and strip gaskets, including the figure-8 gaskets at the end studs, supplied for sealing the oil and water passages between the block and head.

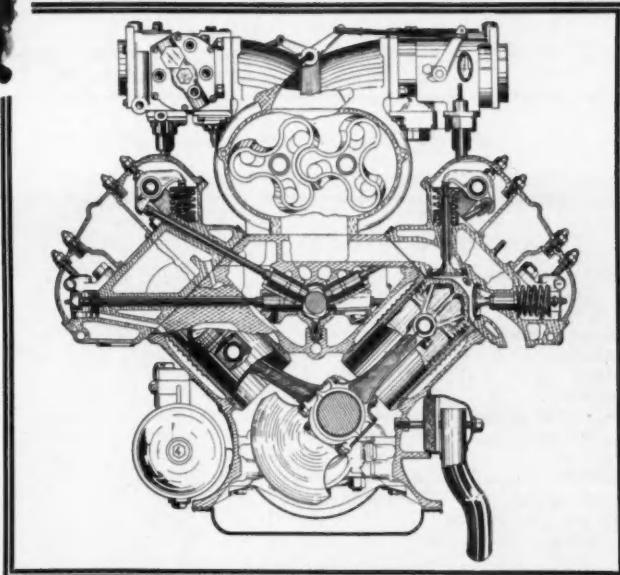




The XP-300 engine, with a bore and stroke of $3\frac{1}{4}$ in., is rated at 300 hp. However, it has developed as much as 335 hp on dynamometer tests. Cylinder blocks and heads are aluminum alloy, resulting in a total weight of only 550 lb.

BUICK XP-300 Engine

Transverse sectional view of the engine showing valve arrangement, piston design, wet-type cylinder sleeves, etc. Low mounting of the Roots-type supercharger keeps overall height at a minimum.

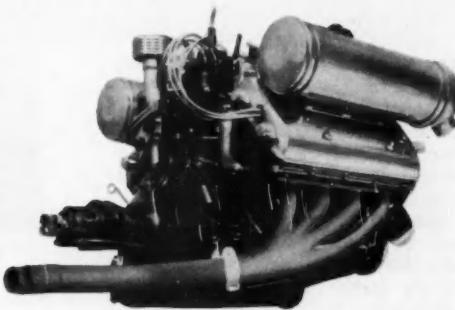


THE Buick XP-300 engine, used in General Motor's Le Sabre and the Buick XP-300 "dream convertible," is strictly for experimental purposes, designed and built with no thought given to production considerations.

Overall height of the engine has been kept down to a minimum by using a very shallow oil pan and a relatively small flywheel, and by dividing the crankcase into two sections. Main bearings, water jackets, and wet type Ni-Resist cylinder sleeves are in the lower crankcase section; the upper section contains the cam-shaft, valve lifters, and intake manifold. Because of its high specific gravity and high tensile strength, bronze is used for the small-diameter flywheel.

A single cam-shaft, chain driven from the front end, is located between the two banks of cylinders. Valve lifters of the hydraulic, self-adjusting type actuate the valves by push rods and rocker arms. Push rods for the exhaust valves operate through drilled bosses in the block between cylinders, and the rocker arms are carried on short, individually-mounted shafts. The

This rear quarter view of the engine shows how the shallow oil pan extends to the rear of the flywheel housing, enclosing the flywheel. A small dry sump is provided around the lower part of the flywheel to prevent unnecessary churning of the oil. Drive is through a special Dynaflo transmission at the rear of the chassis.



valve mechanism is designed to operate without clatter or bounce at speeds up to 6500 crankshaft rpm.

The supercharger is driven by three belts from a pulley located on the front of the crankshaft. Two aircraft type pressure carburetors are used in place of the conventional float type; one supplies gasoline to the engine, the other methanol. The gasoline carburetor is used for all normal driving and is said to give satisfactory operation with present-day premium gasoline for engine operation below 125 hp. Methanol

(Turn to page 108, please)

Michigan Tool Enters Gear-Hobber Field

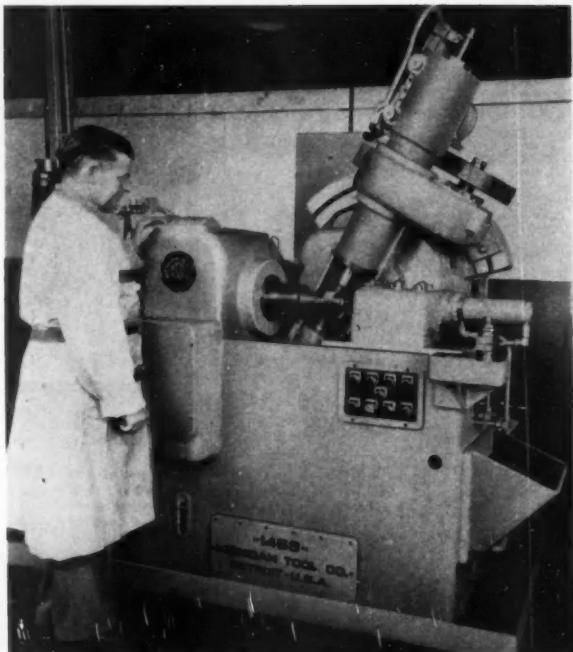
Typical Experimental Run

Gears cut at one	
time	2
OD of gears.....	3 $\frac{1}{8}$ in.
Face width total.....	2 in.
Number of teeth.....	22
Helix	31 2/3 deg
Material	SAE 5130
Harness, Brinell.....	170-207
Hob type	3-thread accurate unground HSS
SFPM.....	290
Time of cut.....	58 seconds
Gears per sharp- ening	265

ROUNDING out its line of gear production tools and equipment, Michigan Tool Co., Detroit, has just brought out a new high-speed, high-production gear hobber designed for faster hob-generating of gears and splines.

Although full utilization of maximum speed possibilities inherent in the machine may have to await development of suitable carbide hobs, it has already made possible the cutting of steel gears with high speed steel hobs at cutting speeds closely approaching so-called "carbide" speeds (see table).

Total relative travel of hob or work during the cut has been reduced by eliminating all except 1/16 in. of "approach feed" of the hob. This has been made possible by using two separate feeds in sequence—a plunge feed to correct depth by the hob, with its centerline just 1/16 in. ahead of the work, followed by a traverse feed of the work across the hob to a point 1/16 in. past center to complete the cut.



New Model No. 145B gear hobber just introduced by Michigan Tool Co.

Feeds of $\frac{1}{8}$ in. or more per revolution of work are handled by the machine and produce gears well within the tolerances required prior to the shaving operation.

Lead errors are avoided by mounting the lead cam directly on the work spindle and virtually eliminating all chances of torsional windup in the hob spindle drive. All machine movements are positively controlled and in accurate timed relation.

Operation is said to be extremely simple. The operator places the work in or on the headstock spindle and pushes a button. The machine cycle even includes hydraulic advance and retracting tailstock, and turning on and shutting off of coolant flow.

(Turn to page 108, please)



• PRODUCTION • EQUIPMENT • PLANT •



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E-34—Hardness Testing Machine

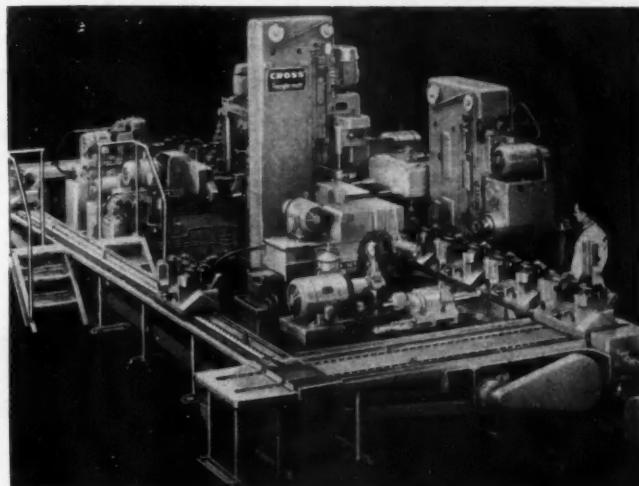
A Brinell hardness testing machine incorporating a deep throat depth of 24 in. and announced by Steel City Testing Machines, Inc., Detroit, Mich., has been made especially for a leading producer of armor plate.

Designed Model AP-1, this C-frame hydraulically operated unit is mounted on wheels so that it can be rolled out of the way when not in use, then easily rolled into position, reaching out over a conveyor. The lower anvil is the top of a hydraulic piston which rises as the load is applied to take the pressure off the conveyor. This also tends to keep the armor plate level while the test is being made. Machines are made to order so that anvil height will conform to customer's conveyor height. The maximum vertical opening between ball penetrator and anvil is 4 in.

Operating cycle is controlled by a simple snap switch mounted on the side of the machine. The switch is turned ON to apply the 3000 kg load, and OFF to release the load. The diam of the impression is measured with a Brinell microscope as in all Brinell hardness testing. The hydraulic unit is located in the base which supports the C frame. Overall dimensions are approximately 41 in. deep by 19 in. wide.

(Turn to page 52, please)

E-35—Ten Station Transfer Machine



For the production of automobile exhaust manifolds, The Cross Co., Detroit, Mich., has brought out this special 10 station transfer machine. This Cross "Transfer-matics" processes 130 pieces per hour. Operations on the manifold include milling the joint face, the hotspot pad and tailpipe pad; drilling, reaming, chamfering, and tapping all holes; and boring the tailpipe hole.

News of the Machinery Industries

Shipments Up

Last month the Bureau of the Census issued a report on machine tool shipments for 1950. Of the \$303 million in shipments by 395 companies, grinding and polishing machines, lathes, and milling machines accounted for 58 per cent of the total value. New England and the East North Central States accounted for 85 per cent of the total. The accompanying chart gives the dollar value of the major types of machine tools shipped.

This year, according to the Federal Reserve Board, machinery output is up by more than 25 per cent, but the increase has been very moderate in recent months.

CMP allotments for the fourth quarter of 1951 for metal working machinery and equipment amount to 643.5 million tons of steel, 25.1 million lb of copper and copper base alloys, and 7.6 million lb of aluminum.

The American Society of Tool Engineers has a plan underway to locate non-machinery manufacturing plants with the capacity and ability to produce machine tools and components and put them in touch with machinery builders seeking added capacity.

New NPA "Assistance"

According to the NPA, machine-tool builders who are unable to obtain metal-working equipment may apply

to the NPA for assistance in getting it. On application from a machine-tool manufacturer, the order will be reviewed by the NPA. When the needed tool is located, preferably available for immediate shipment, NPA, after "appropriate review," will order the builder to divert the tool to the machine-tool manufacturer who needs it for facilities expansion. If this order works out as planned, it will give the machine tool people first call on the products of their industry.

Certificates of necessity for rapid tax write-off for new electroplating plants or present plant expansions were advised against by the Electroplating Industry Advisory Committee of NPA. (Turn to page 86, please)



NEW EQUIPMENT PLANT



For additional information regarding any of these items, please use coupon on page 60

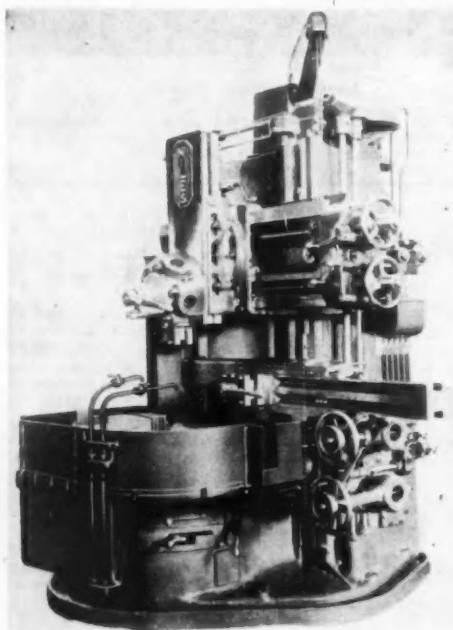
(Continued from page 51)

E-36—Boring and Turning Mill

A Niles 42 in. vertical boring and turning mill with side head has been announced by Baldwin-Lima-Hamilton Corp., Hamilton, Ohio. The machine has increased table speeds and corresponding feed changes; by use of anti-friction bearings in the table speed change gear box and table mounting; and by a higher powered drive from a 30-hp motor.

Actual swing with side head down is 50 in. Maximum distance from table top to turret face is 48 in. The vertical head, which has five faces, has a slide travel of 28 in. and will swivel 45 deg to either side of vertical position. The side head, which has four faces, has a vertical working travel of 35 in. and a horizontal travel of 21 in.

There are 12 table speeds ranging from nine to 200 rpm and 16 feeds for either vertical or side head between 0.003 and 0.520 ipm of the table. It occupies a floor space eight ft four in. wide by eight ft 10 in. deep and stands 10½ ft high.



Niles vertical boring and turning mill with side head.

E-37—Multiple Station Induction Forge Heater

Providing speed and flexibility that make it equally adaptable to either civilian or defense production, new Ajax-Northrup induction forge heating equipment, manufactured by Ajax Electrothermic Corp., Trenton, N. J., automatically heats a wide range of billet sizes and shapes to a variety of pre-selected heating patterns.

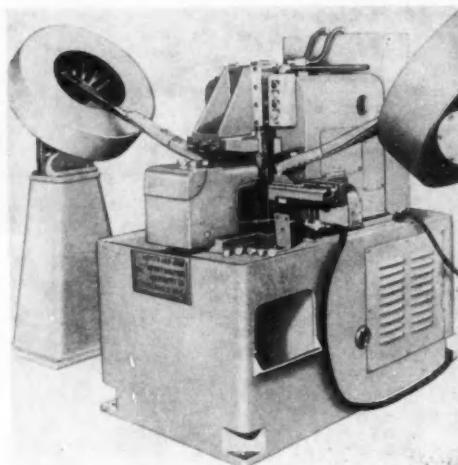
Three of these equipments, each with a power range of from 50 to 1500 kw, 400/800 volts, and 3000 cycles, are now in use heating steel bar stock for automotive forgings. Billet sizes from one to four in., either rounds or squares, can be handled, and are heated to 2250 F at a maximum rate of 7500 to 8500 lbs per hr.

Each equipment has space for 8 heating stations with some 30 interchangeable heating units to accommodate the different sizes of bars. Each heating station has its own transformer, capacitors, push buttons, signal lights, automatic timers, hydraulically operated billet feeding devices, and protective relays; yet they can be arranged to work together in combinations to feed uniformly heated billets to the forge.

Each heater station comprises two coils in series. They may be operated to eject heated bars automatically or the back heater may be de-energized and the front heater used for bar end heating. In this case signal lights are arranged to advise when to remove the bar manually. Coils are adapted to draw an average power of about 200 kw but since at any given time some are operating at high and others at low power the average power drawn from the equipment as a whole is near its top rating.

E-38—Automatic Forming Machine

The Motch & Merryweather Mach. Co., Cleveland, Ohio, has added a second



Motch & Merryweather automatic forming machine.

model to its line of cam automatic forming machines. All machine functions are mechanically controlled by one main camshaft. This model turns the OD and chamfers one end of laminated silicon steel motor rotors. Varied lengths of any one diameter can be handled. Production is 800 pieces per hour.

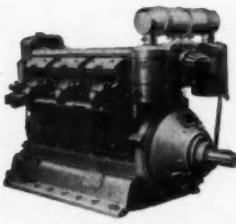
Cam automatics can be furnished with hopper or magazine feed. Where long pieces are to be formed and cut off, a hydraulically operated bar feed can be included. The main camshaft has its own drive motor, as has each of the two spindles.

(Turn to page 67, please)

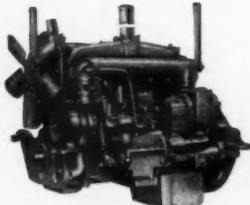
SOME Famous ENGINES EQUIPPED WITH SCHWITZER-CUMMINS SUPERCHARGERS



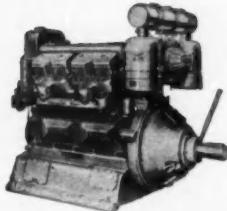
Model 487-C—Harnischfeger Corporation 6 cylinder, 2 cycle using two S.C. superchargers.



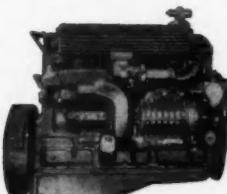
Model D-397—Caterpillar Industrial Diesel V-12.



Model D-337—6 cylinder—Caterpillar Diesel.



Model D-375—Caterpillar Diesel V8.



Model HRB-400—Cummins Engine Company, Inc.
(Used also on HBS Series)

More than twenty-five years of research, intensive engineering, wide field experience and unexcelled manufacturing facilities are back of our product.

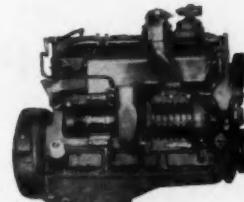
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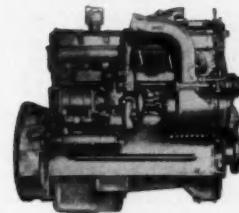


Model 487-C—Harnischfeger Corporation
4 cylinder, 2 cycle.



Model NHRBS-400—Cummins Engine Company, Inc.
(Used also on NHS-NHBS-NHRS.)

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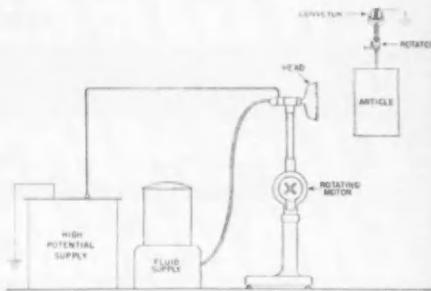


Fig. 1—Diagrammatic sketch of the general arrangement of equipment and work in the new Electro-Spray process.

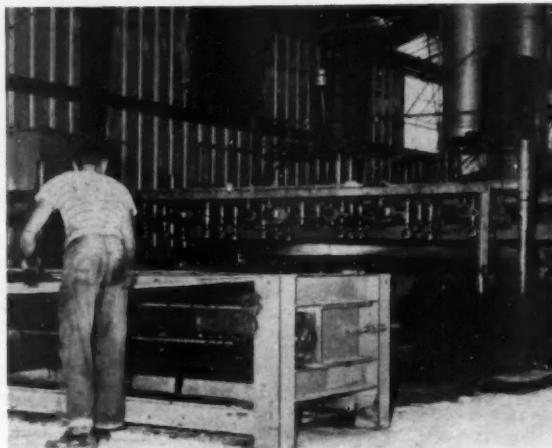


Fig. 2—Experimental installation at the Butler Manufacturing Co. for handling the automatic spray painting of roofing and siding for steel buildings.

Electrostatic Atomization —a New Painting Process

FOLLOWING its successful introduction of electrostatic paint spraying with conventional automatic spray guns, Ransburg Electro-Coating Corp., Indianapolis, Ind., recently announced its No. 2 Electro-Spray process, a revolutionary improvement in electro-coating. Extremely high efficiency is claimed for the new system, up to 98 per cent for some types of work.

The basic feature of the No. 2 process is the development of electrostatic atomization. In the new system the work to be coated is carried on a conveyor through a spray station fitted with one or more special spray guns. The new gun is actually a hollow head of special form into which the paint or coating material is metered by means of a positive displacement pump. The gun or head is rotated at an established speed by means of a motor and this rotation promotes the spreading of coating material uniformly over the inner surface of the head, thus permitting it to flow evenly to the outer edge.

In this system the work and conveyor are grounded while the head is given an electrostatic charge of about 90,000 volts to create a strong electrostatic field between the head and the work. This field serves the dual purpose of atomizing the coating as it leaves the edge of the head as well as providing the strong force that attracts the charged particles to the grounded work.

It is of interest that the process eliminates the use of conventional air-operated guns and associated

equipment, eliminates overspray, and makes unnecessary the usual comprehensive design of water-back spray booth. At the same time variables such as atomization air pressure, spray pattern, fluid delivery, etc., are said to be effectively eliminated. The only requirement is provision of an adequate canopy and exhaust system to assure worker comfort.

The system is extremely flexible and can be designed for handling a wide variety of work through a suitable arrangement of spray heads and conveyor systems. Depending upon the size and form of the work, Ransburg makes available single heads or banks of triple heads. Triple heads are mounted on a special drive which has universal mounting and is driven by a single motor through gearing. The head is freely adjustable in any position in the three planes. Single heads, on the other hand, can be disposed as required about the work. In one instance, the spraying of steering wheels, two heads are used—one pointing downward, the other upward so as to cover both sides of the wheel.

A diagrammatic sketch of the general arrangement of equipment and work in the new system is found in Fig. 1. One of the major experimental installations having automotive interest is illustrated in Fig. 2. In use at the Butler Mfg. Co., Galesburg, Ill., the process handles the automatic spray painting of roofing and siding for U. S. Navy utility steel buildings. As seen here, the panels are transported on a slat conveyor under a battery of 18, triple-head spray heads. It is claimed that the process has shown an average

(Turn to page 100, please)

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METALS

*Most Metal Shortages May End Within Another Year;
Smelters of Foreign Copper Ores Get Price Increase*

By William F. Boericke

Metal Prices Steady

In contrast with the weakening trend of general commodity prices during the last few months, the steadiness of metal prices is noteworthy. The Engineering & Mining Journal's weighted index of non-ferrous metal prices was 186.46 in July compared with 190.19 in March, a decline of less than two per cent. Had it not been for the precipitate decline in the tin price which enters into the composite index, it would have remained unchanged.

The Defense Minerals Administration declares that by the end of another year there won't be many deficiencies in supply of most metals. Copper will still be short of demand, maybe 15 per cent. Tungsten and cobalt output will be far from adequate. But shortages of zinc, lead, nickel, and aluminum will be largely over.

On October 1 the Controlled Metals Plan will be extended to all users of steel, copper, and aluminum. It is believed in metal circles that steel output is rising faster than Washington admits. It is known that aluminum production will be 50 per cent higher in 1952 but no such optimism is felt for copper. Any substantial increase must wait until 1954-5.

The chairman of Bethlehem Steel recently charged that the CMP is causing regular steel customers to overstock, as well as letting a lot of "fly-by-night" consumers get steel and then sell it in the black market. Under CMP there will be practically no "free" steel available for non-essential civilian consumption this year, but no limitation is set for small consumers who use not more than five tons of carbon steel or $\frac{1}{2}$ ton of alloy steel in any one quarter.

More Steel Available Soon

Looking ahead for six months, it seems very probable that barring all-out war, more steel will be available for non-essential consumption after providing for defense and defense-supporting purposes. The heavy increase in steel plant capacity now in progress will boost steel output 20 per cent in 1952, besides relieving the industry of the substantial tonnage now being subtracted from current production for this plant expansion.

At present the steel industry is well supplied with iron ore, but is short of pig iron and particularly of steel scrap. It is the current scarcity of scrap that threatens to cut down steel output in the third quarter from the record 102.3 per cent capacity that was maintained in the second quarter. Steel mills have opened their own drive for scrap and have called for help from local Chambers of Commerce. Steel mills and foundries used nearly 30 million tons of purchased scrap

in 1950; they will want 36 million tons in 1951.

The Office of Price Stabilization at long last granted a three-cent per lb price increase to custom smelters who process foreign copper ores and concentrates. It was almost obligatory on OPS to make the adjustment, because otherwise the smelters could not afford to pay on the basis of $27\frac{1}{2}$ cents per lb for foreign ores unless they could pass on the higher cost to their own customers. This was the first instance that the price of any major non-ferrous metal has been officially increased since OPS took over in January.

Until the price increase was granted the copper situation was becoming more alarming every day. Imports were drying up at a rapid rate and foreign copper mines were shipping to Europe where a higher price was gladly paid than obtained in the United States. Since January of this year copper imports have declined about 50,000 tons below the total imports for the comparable period of 1950. To make the situation worse, domestic production was hit hard by the strike at the Garfield smelter which lopped about 25,000 tons off the new copper supply. Reports persisted of other strikes to be called later in the month that would halt production in all the Nation's principal copper mining and smelting plants. Faced with this possibility, it was imperative that there should be no interruption to the inflow of 40,000 tons of copper that are normally counted upon to supplement domestic production.

Strike Cuts Copper Output

As a result of the Garfield strike, which in effect cut domestic output more than 25 per cent while it lasted, NPA has had a more difficult time in allocating copper because now it isn't sure how much metal it will have to allot. In most instances allotments will have to be cut.

A dual market now exists for copper with attendant difficulties and confusion. In past years a dual price has never lasted very long, but conditions are different today. While most domestic copper producers are severely critical of the alleged unfairness in paying a higher price to foreign producers than to domestic, the biggest factor in the copper industry, Kennecott Copper Corp. has gone on record in opposing any higher domestic price than $24\frac{1}{2}$ cents. Kennecott officials take no altruistic attitude but oppose a higher price because of giving aluminum a competitive price advantage over copper in many industrial markets.

Copper fabricators shipped 129,200 tons of copper products in June, the highest for more than a year. At the same time their stocks of refined copper fell to 237,800 tons, lowest figure since the war. New business booked in June was the largest since January of this year.

The House approved a bill to suspend the import
(Turn to page 98, please)

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The application of solid chrome plating to piston rings, perfected by Perfect Circle, more than doubles the life of pistons, rings and cylinders. Performance data will be furnished upon request.

New Aluminum Casting Alloy For Higher Temperatures

A NEW light metal casting material for use in high temperature operation has been developed at the Materials Laboratory at the Wright Air Development Center, Wright-Patterson Air Force Base. Known as ML aluminum alloy, it is said to have properties approximately one-third better than older elevated temperature aluminum alloys. New aircraft will require casings, supports, and many other parts designed to operate at temperatures between 500 and 600 F instead of the 200 to 300 F temperatures formerly encountered. It was to meet this need that the new alloy was developed.

All known alloys used by different nations for elevated temperature work were studied as a first step in the research work. The alloys tested and the properties obtained are listed in Table I. From this group four were chosen as being basic. They were Y alloy, Hydronalium 511, RAE 55, and DCK, a theoretical laboratory alloy. Many melts based primarily on variations and combinations of elements of these four materials were made. Their physical and mechanical properties were evaluated.

It was observed that during elevated temperature tests, failure started in numerous places for some of the compositions. This phenomenon was arbitrarily called surface tear and was considered to be undesirable, since alloys which exhibited this condition were found to be poor in creep. The preliminary work also revealed that manganese, in excess of 0.3 to 0.4 per

TABLE I
MECHANICAL PROPERTIES OF STANDARD ALLOYS

Designation	Tensile Strength, psi		Elongation, % in 2 in.	
	Room Temp.	600 F	Room Temp.	600 F
"Y" Alloy.....	33,400	13,000	1.0	8.5
"X" Alloy.....	27,200	9,000	3.0	20.0
"X" Alloy.....	29,800	9,000	3.0	20.0
HY 511.....	27,800	12,800	4.5	60.0
Cerulium.....	33,300	13,000	1.0	16.0
RAE 55.....	30,500	15,000	1.5	3.0
DCK-1.....	30,000	12,000	1.2	9.0
DCK-2.....	30,000	15,000	1.0	8.2
QM 55.....	24,600	12,400	2.0	22.0
RR 58.....	29,700	10,500	1.2	11.0
Japanese.....	30,000	11,000	1.0	70.0
RR 53C.....	29,500	7,000	8.0	27.0
Avanal.....	29,500	8,100	1.0	18.0
Silumin.....	23,600	8,200	4.5	20.0

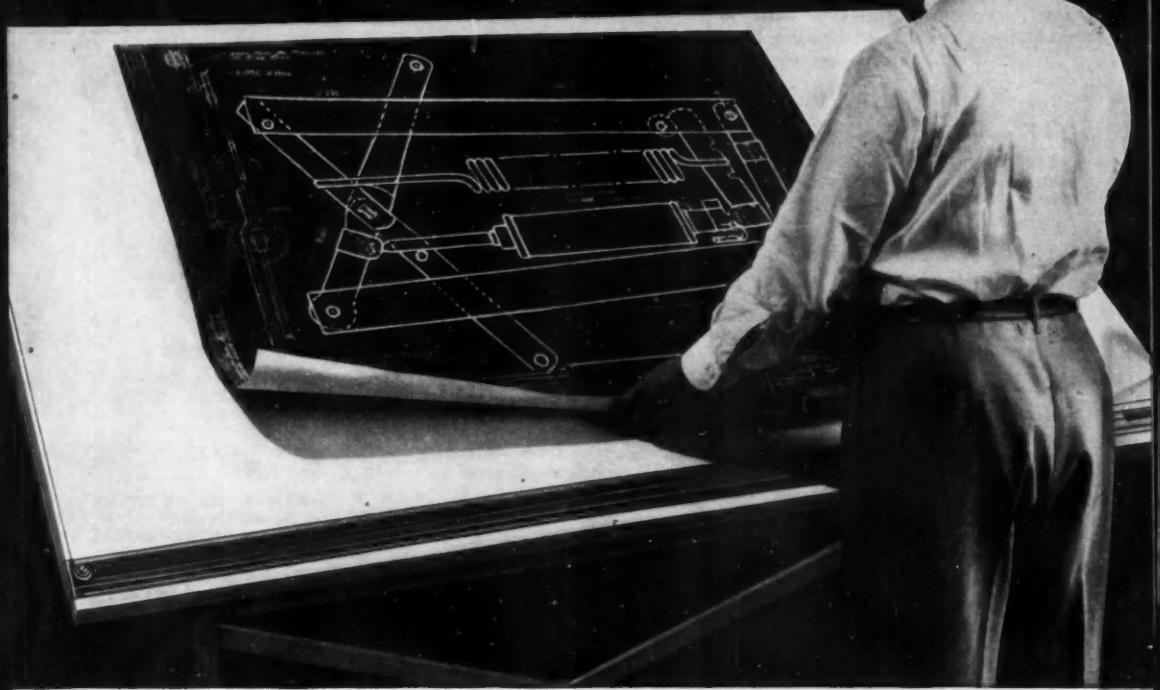
TABLE II
MECHANICAL PROPERTIES OF ML ALUMINUM ALLOY

	Temperature of Test	Properties
As-Cast		
Typical tensile strength.....	Room	33,000 psi
Yield strength.....	Room	31,000 psi
Elongation, % in 2 in.....	Room	1.25%
Minimum tensile strength.....	Room	30,000 psi
Maximum tensile strength.....	Room	38,400 psi
Tensile strength.....	400 F	29,300 psi
Yield strength.....	400	27,400 psi
Typical tensile strength.....	600 F	16,300 psi
Yield strength.....	600	14,300 psi
Elongation, % in 2 in.....	600	8.0%
Minimum tensile strength.....	600	16,150 psi
Maximum tensile strength.....	600	17,300 psi
Tensile strength after 1200 hr stabilization.....	600	14,200 psi
Tensile strength after solution heat-treatment and age.....	Room	44,000 psi
Machined (skin removed)		
Minimum creep rate 0.0002%/hr.....	600 F	4,100 psi
Stress rupture, 1000 hr.....	600	6,600 psi
Nominal Composition: 4% copper, 2% nickel, 2% magnesium, 0.3% manganese, 0.3% chromium, 0.05% vanadium, 0.1% titanium, in aluminum base.		

cent, and several other elements were considered undesirable since they imparted poor thermal conductivity to the castings.

A plan of microscopic study was carried out on each of the melt variations. The fractures of the room temperature and hot tensile tests were carefully examined visually at low and high magnification to determine the manner in which the samples failed, and the effect of the matrix and constituent material on the strength. As a result a partially cellular constituent was sought which would act as a reinforcement, and minor or trace amounts of hard elements, which have partial solid solubility, were added to strengthen the matrix. For copper, magnesium, nickel, major ele-

(Turn to page 90, please)



THERE'VE BEEN SOME CHANGES MADE!

Only genuine parts assure efficient operation of
Hydro-Lectric window and top mechanisms

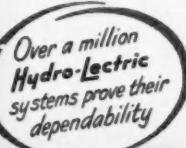
There's a lot of experience wrapped up in making over four million* Hydro-Lectric automatic window regulators and top operating mechanisms.

Naturally, we've made the most of the knowledge we've gained—it's resulted in countless engineering improvements. For example, certain parts formerly die cast of zinc are now made of steel to assure corrosion resistance, longer life and smoother operation.

As original equipment manufacturers, we can immediately incorporate such improvements in replacement parts. Imitators can't begin to keep up with these constant developments.

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Publications

AVAILABLE

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D-64 Stud Welding

KSM Products, Inc.—A new 32-page, pocket-size stud welding operating manual has been issued for industry use.

D-65 Variable Speed Drive

Metron Instrument Co.—Technical data sheet, No. 4C, describes a miniature variable speed drive with push rod ratio control.

D-66 Stainless Steels

Allegheny Ludlum Steel Corp.—A new handbook on the stainless steels is available for distribution to users of the heat and corrosion resistant metals.

D-67 Twist Drills

The DoAll Co.—Twist drills are featured in a new 12-page catalog, No. 51-816.

D-68 Governors

The Pierce Governor Co.—"How to Get the Most Out of Your Governor" is the title of the latest issue of Control, a presentation of (centrifugal) governor problems and applications.

D-69 Riveting Tools

Hi-Shear Rivet Tool Co.—A new catalog reflects changes in the firm's tool sizes and basic clearance dimensions, and includes several new items.

D-70 Incinerators

Plibrico Jointless Firebrick Co.—Offered is a catalog of industrial incinerators for rubbish disposal.

D-71 Controls

Machinery & Allied Products Institute—Presented in Bulletin 2483 is an

analysis of the OPS memo on capital goods prices.

D-72 Threaded Bars

Joseph T. Ryerson & Son, Inc.—A new bulletin titled "Ryerson Threaded Bar Service" gives data on size range, lengths, kind of threads, bending, and types and finishes of threaded steel bars.

D-73 Plugs

Joy Manufacturing Co.—Announcement is made of a bulletin, SM-2, that illustrates and describes Push-lock type plugs for portable feeder cables to welding machines.

D-74 Textured Metal

Rigidized Metals Corp.—Metal conservation is the basic theme of an eight-page folder covering military and civilian applications of Rigidized metals.

D-75 Bending Techniques

Pines Engineering Co., Inc.—Announced is a new bi-monthly news bulletin dealing with tube fabricating machinery.

D-76 Rolling Mills

E. W. Bliss Co.—Design and application features for a wide range of rolling mills and accessories are described and illustrated in a new 52-page brochure.

(Turn to page 96, please)

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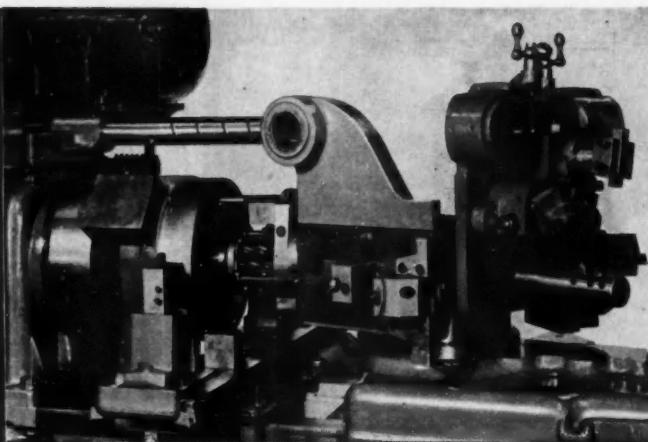
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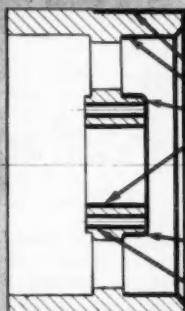
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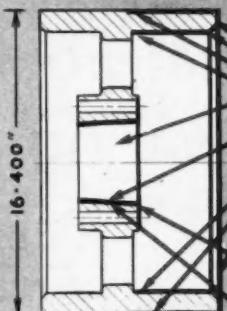


P&J 5DE AUTOMATIC



1ST OPERATION

- 1ST T. F.
Rough Face at Rim
Rough Turn O. D. Halfway
Bore Under Rim
Turn O. D. of Hub
Rough Bore Hole Straight
- 2ND T. F.
Finish Cuts Roughed on 1st
T. F. Except Hole
- 3RD T. F.
Face End of Hub (Slide Tool)
- 4TH T. F.
Drill 3 Holes — 2 Tapped
Holes and C'Bore



2ND OPERATION

- 1ST T. F.
Face at Rim
Machine Bevel Under Rim
Rough Turn O. D. to Jaws
Bore Under Rim
Rough Bore Hole Straight
- 2ND T. F.
Rough Bore Taper Hole (Slide
Tool)
- 3RD T. F.
Finish Bore Under Rim
Finish Turn O. D.
Finish Face at Rim
- 4TH T. F.
Rough and Finish Face Hub
(Slide Tool)
- 5TH T. F.
Finish Bore Taper Hole
(Single Point Cut, Slide Tool)

You should see it in operation — this typically efficient P&J high-speed method for machining Pulleys on a precision-production basis. The machine best fitted for the job is the P&J 5DE Power-Flex Automatic with its 17 inch swing over the cross-slide. The Tooling on its 5 turret faces and cross-slide consists mainly of P&J's standard turret tool units, augmented by P&J-designed slide tools for machining the hub ends and taper hole, and a P&J-designed

multiple spindle drill head which is aligned automatically for the proper position of the 5 holes in the hub and which rotates with the work. The cycle of operations is fast and fully automatic . . . results in faster and better machining . . . to closer limits of accuracy . . . with fewer rejects . . . at a highly profitable rate of production.



Numerous similar examples of productivity with P&J Tooling on P&J Automatics are illustrated in this free booklet. Write for your copy.

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Subsidiary of PRATT & WHITNEY
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PAWTUCKET, RHODE ISLAND, U. S. A.

Precision Production Tooling for 53 years





In this the first of six setups for producing bearing retainers from $\frac{1}{4}$ -in. stock, blanks placed in a magazine are fed automatically into the draw die by a slide. A gun squirts draw lubricant onto each blank.



Setup for the second operation. Workpieces are loaded by the hand fork shown in the foreground instead of from a magazine as in the first operation. A similar arrangement is used for the four subsequent operations.

Special Six-Press Setup Stamps Bearing Retainers Faster

BEARING retainers for rear axles of cars manufactured by the Lansing, Mich., plant of the Oldsmobile Division, General Motors Corp., are hat-shaped stampings. Until recently, such stampings were produced in two three-station progressive dies that could be accommodated only in two large presses whose output often failed to meet requirements. Shortages arose because of excessive down time for repairs to the progressive die. When there was trouble at any one station, production ceased completely, of course, until the die could be adjusted or repaired.

Because of these difficulties and the fact that the large presses were needed for other work, it was decided to convert the setup into one involving six separate presses, each of 250 or 300-ton capacity and each equipped with a single-cavity die. Although this change required more press operators, it was found that a higher output per average day could be attained and that, if trouble occurred, it could be remedied more quickly and without shutting down the whole line.

In consequence, a row of six new presses has been installed and is now producing more consistently and economically than the presses employed before. To accomplish this result, fast feeding is necessary and rapid transfer from press to press is required. Work-

By R. E. Hansen

General Supervisor of
Production Engineering—Sheet Metal,
Oldsmobile Div., General Motors

pieces ejected from each press fall into a chute and then onto a short elevating belt that delivers them into a hopper from which they feed as rapidly as needed to the next press operator.

Each hopper can hold a bank of about 200 parts or enough to keep the line running for about 20 min. if any one press must be shut down. At the first press circular blanks $\frac{1}{4}$ in. thick are placed by hand in a magazine and feed, one at a time, from the bottom of this magazine into a slide that carries them into the die and drops them there. On the way into the die, a timed spray of draw lubricant is applied to each blank. The punch has a round nose and, in drawing the blank into the die, produces a hat-shaped stamping that remains in the die until automatically knocked out by the end of the loading slide when the slide is advanced to reload the die.

After being elevated into the hopper at the next press, the workpieces feed into a trough from which they are picked up with a hand fork and are placed, flange down, over the punch which is in the bottom half of the die. The first redrawing then occurs. When the die opens, the piece sticks in the upper half and is elevated until it strikes a knockout. This causes the workpiece to fall onto an inclined tray which is a part of the die and rocks into position just before

(Turn to page 88, please)

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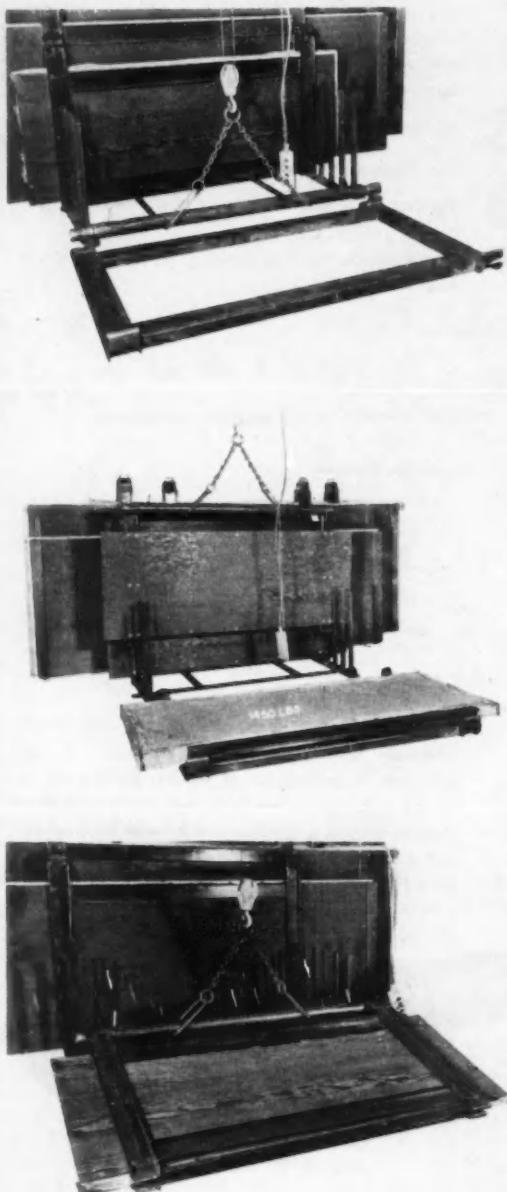
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New Handling System for Stocks of Sheet Metal



A NOVEL and efficient method of storing sheet metal stock as books in a library has been developed at Pratt & Whitney Aircraft, East Hartford, Conn. It is claimed that the system, much more satisfactory than conventional flat storage of sheets, will result in a 90 per cent saving in the man-hours required for handling the large quantities of sheet metal stock used by P&WA in its production of turbojet and turboprop engines.

The storage and finding problem arising from large stocks of sheet metal in a wide variety of compositions and thicknesses is particularly acute at P&WA. The manufacture of P&WA's several Turbo-Wasp engines calls for sheets of 14 different alloy steels, 11 different aluminum alloys, and nimonic alloy (80 per cent nickel, 20 per cent chrome), in a range of thicknesses running from 0.018 in. up to 0.25 in. The problem is further complicated by the fact that each gauge and composition comes in a variety of sheet sizes, giving a total of 355 different combinations.

In the new "library" system of storage there is at least one "book" for each of these combinations. Each book holds a maximum of 1500 lb, and there is space in the "bookcase" for 475 of these books.

When a new crate of sheet metal stock is received, it is placed on a welded steel transfer rack. An overhead crane does all of the handling of sheet metal. The top of the crate is removed and one of the covers of the book—made of heavy plywood rein-

(Turn to page 116, please)

At the top is seen how a book starts. This transfer rack is placed on the floor to hold the shipping crate in which the sheet metal is received at the plant.

The middle illustration shows the vendor's crate is placed on the rack and the top of the crate is removed. The steel channel which forms the baseplate is hooked into the rack (foreground).

In the lower view is a complete book, ready to be transferred to its proper place in the vertical storage rack.



Reproduced from Original Bas-Relief, Cathedral of Toledo, Spain

Heritage of the Centuries

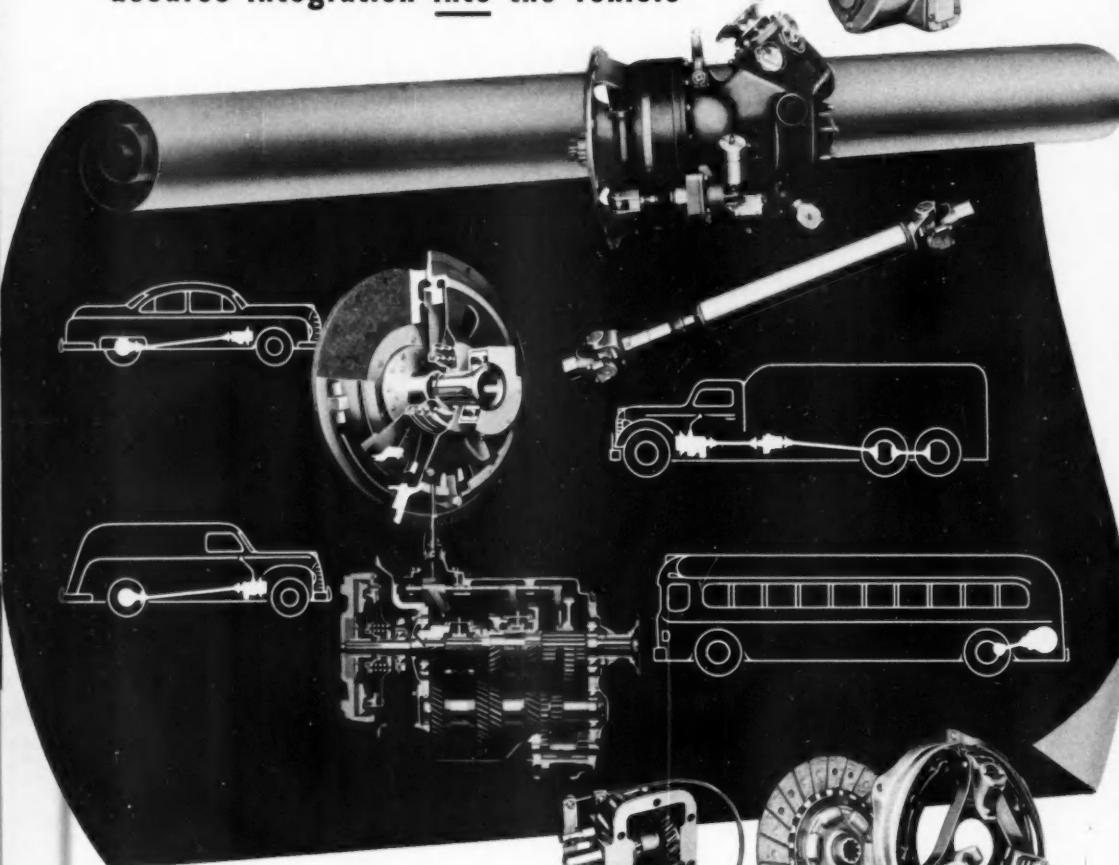
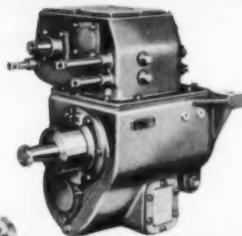
The Spanish city of Toledo in the Fifteenth Century was the world center of steel craftsmanship. Artisans forged and shaped and tempered outstanding instruments of peace and war. The immortal quality of their accomplishments lives on in the modern American city of Toledo.

Here Spicer, backed by nearly fifty years of experience, maintains the centuries-old standards of fine steel artistry, with automotive power transmission equipment that is the "Standard of the Industry."



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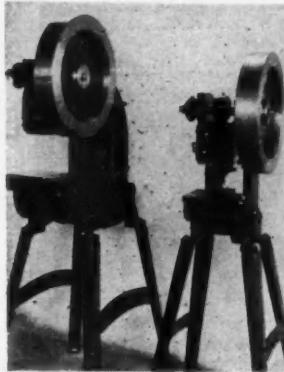
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NEW PRODUCTION AND PLANT EQUIPMENT

For additional information please use coupon on page 60

(Continued from page 52)

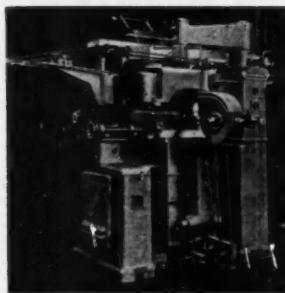
E-39—Punch Presses



Two five-ton power presses, the standard five-ton, variable speed and the four-in-one five-ton variable speed with ram speeds suitable for deep drawing, piercing, and blanking operations, have been developed by the Kenco Mfg. Co., Los Angeles.

The flywheel is 18 in. diam and weighs 110 lb. Ram speeds can be varied from 95 to 280 strokes per min by adjusting the variable speed motor pulley diameter from $\frac{3}{4}$ -in. to $2\frac{1}{2}$ -in.

E-40—Profile Grinder



Cosa Corp., New York, is marketing a larger Studer profile grinder designated as type PSM-250. Increased capacity of this Swiss machine permits grinding profiles up to 12-in. long on one setting; and to accept flat work pieces up to $4\frac{1}{2}$ in. thick and round pieces up to 10-in. diam. Maximum template length is 24 in. The pantograph is adjustable from 1 to 1 to 1 to 10 ratio. Depending on the accuracy of templates, profiles can be ground to a tolerance of ± 0.0002 in.

(Turn to page 68, please)



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NEW EQUIPMENT PLANT

For additional information regarding any of these items, please use coupon on page 60

(Continued from page 67)

E-41—Drilling Machines

Two series of sensitive drilling machines, known as Hi-Eff., have been placed on the market by the Taylor

Dynamometer & Machine Co., Milwaukee, Wis. Series A, available in bench type only, has a speed range from 800 to 10,000 rpm in steps of about 100 rpm. Motor is 1/7 hp.

Bench and floor models are available

in the B series. Machines in this category can be supplied with two ranges of spindle speeds—750 to 2700 rpm or 1500 to 8000 rpm.

Taylor Hi-Eff Drilling Machine Specifications

	"A" Series 11"	"B" Series 20"
Drills to center of circle	11"	20"
Maximum distance chuck face to table	9 1/4"	18 1/4"
Travel of drill slide	2 1/8"	4 1/4"
Minimum hole diameter	10"	16"
Diameter of column	1 1/4"	2 1/4"
Bench or floor space	10' 1 1/2"	16' 3 1/2"
Working surface	9' x 20'	13' x 32"
Overall height (Bench Model)	23 1/2"	40 1/2"
Overall height (Floor Model)	23 1/2"	40 1/2"
Weight (Bench Model)	111 lb	300 lb
Weight (Floor Model)	462 lb	462 lb

The Thew "Swing-Stacker" revolves through 360°, transports 5000 lb. load at 7 mph.

"Swing-Stacker" PERFORMANCE calls for UNUSUAL ENDURANCE of

TUTHILL ALLOY STEEL SPRINGS

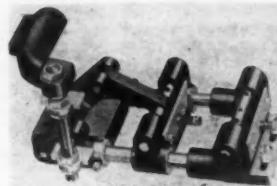
Special Leaf Springs designed to meet any requirements.

TUTHILL SPRING CO.

760 WEST POLK STREET • CHICAGO 7, ILLINOIS



E-42—Stamping Press Automatic Feed



Producto Machine Co., Bridgeport, Conn., has developed this positive action automatic feed called the "Surefeed." Mounting is made directly on the die set. Stock up to two in. wide and 0.0045 in. thick can readily be advanced by this feed through movement of the press.

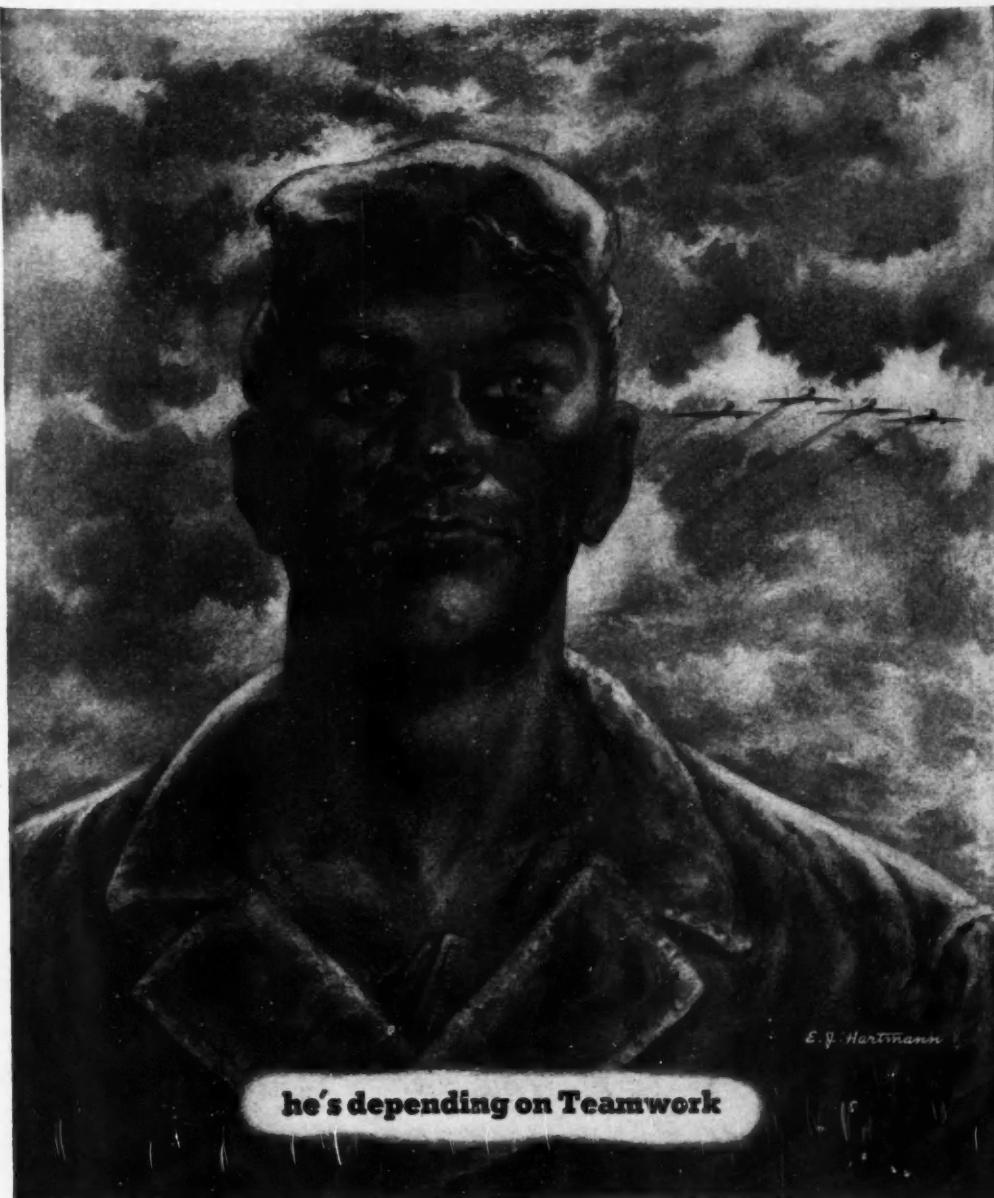
E-43—Precision Tumbling Machine

Large quantities of parts are precision finished at one time in the new Model DW-60-36-2 automatic control precision tumbling machine developed by the Roto-Finish Co., Kalamazoo, Mich. This push-button operated machine has jogging provisions and a magnetic reversing starter with 110 volt control transformer. Once the machine is started, an automatic timer stops its operation any time from 0 to 20 hrs without further attention. It also has a 5 hp variable speed power unit with a remote control handle for adjusting the speed of the cylinder from 10 to 30 rpm.

The operator works in complete safety. A safety switch prevents the machine from operating whenever the reinforced safety gate is raised. Cam locks on the doors have spring-loaded pressure releases to prevent excessive pressure build-up within the machine. The motor is mounted on the rear of the machine for safety, motor protection and ease of maintenance.

Each of the machine's two compartments has a capacity of 18 cu ft. It is rigidly built of 3/16 in. steel. Side supports, motor mount and floor are all integral parts of the frame. Because of its rigid construction the machine does

(Turn to page 70, please)



E. J. Hartmann

he's depending on Teamwork

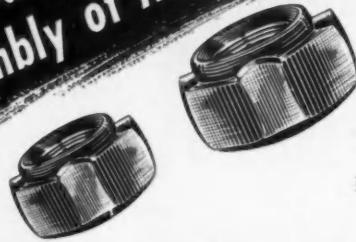


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HYDRAULICS • ELECTRONICS • ELECTRO-MECHANICALS • SPECIAL AIRCRAFT DEVICES

Air Associates
INCORPORATED
TETERBORO, NEW JERSEY

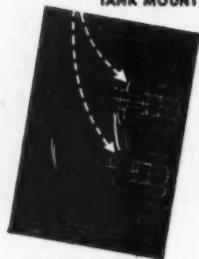
The
ANSWER
 to "Blind Spot" Problems
 in Assembly of Metal Parts



MIDLAND WELDING NUTS



COMPRESSOR
TANK MOUNT



ENGINE MOUNT

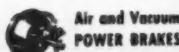
• Welded to inside spots, where it is difficult or impossible for hands or tools to reach, MIDLAND WELDING NUTS hold fast while bolts are turned into them.

This method speeds up the assembly of metal stampings, and helps spread the use of manpower. Midland Welding Nuts enable one man to do the work formerly requiring two, while one worker held old style nuts from turning.

Investigate the need for Midland Welding Nuts in your plant. Write or phone for complete information.

The
MIDLAND
 STEEL PRODUCTS COMPANY
 6660 Mt. Elliott Ave. • Detroit 11, Mich.
 Export Department 38 Pearl Street, New York, N.Y.

World's Largest Manufacturer of
 AUTOMOBILE and TRUCK FRAMES



Air and Vacuum
POWER BRAKES



Air and
Electro-Pneumatic
DOOR CONTROLS

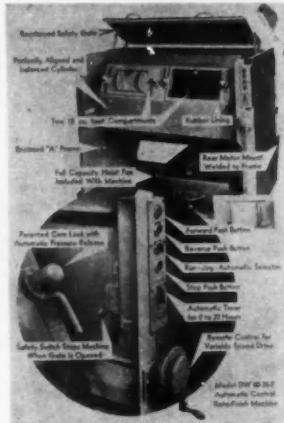
NEW PRODUCTION AND PLANT EQUIPMENT

For additional information please
use coupon on page 60

(Continued from page 68)

not have to be bolted to the floor of the building.

Cylinder shafts are mounted in 2 7/16 in. self aligning ball bearing pillow blocks. cylinders are made in jigs for



Roto-Finish precision tumbling machine,
Model DW-60-36-2.

perfect alignment. Shafts are double supported with gussets and bells. The machine has been designed for use with the hoist pan system of loading and unloading.

E-44—Work Stations

The Coleman-Pettersen Corp., Cleveland, Ohio, is offering Erectosemby work stations which are designed for assembly line operations. Originally developed in conjunction with the Hughes Aircraft Co. to facilitate production in two new departments, these work stations can accommodate various types of large and small assemblies. Parts can be loaded from the rear of the stations.

Made to meet individual requirements, Erectosemby work stations incorporate two main components: large flat wire baskets for the storage of fabricated parts and sub-assemblies, and plastic cups placed on both sides of a revolving frame to contain screws, nuts and small parts. The baskets, which can be furnished in any desired size or shape, can be moved to meet production demands. They can be fabricated of wire in any size up to $\frac{1}{2}$ -in. diam, expanded metal, wire mesh, sheet metal or any combination of these materials.



WE'VE PAID YOUR "EXPERIMENTAL" BILL

Yes, that's right—you can bid on munitions jobs like this without figuring in any costs for educational orders, trial setups, experimental tooling.

National Acme engineers have done all that for you, months ago. They've worked out standard tooling setups, machining times, tolerances and production

methods for countless munitions parts. And these standards have been proved in use on batteries of Acme-Gridley Automatics, all over the country.

This ready-made experience is available for the asking. And in addition, our engineering experts will gladly give you the very latest information on

how to get increased production and top performance from your present Acme-Gridley Multiple Spindle Automatics. May we help you turn your production line into a profit line, now?

JOB FACTS

PART: Nozzle plate ring (Ordnance Division)

MATERIAL: SAE 1020 tubing blanks

SIZE: 5" diameter x 3"

MACHINE: 8" RPA—6 Spindle Acme-Gridley Chucking

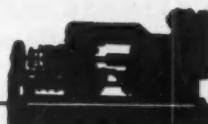
1ST SET-UP: 14 operations—46 seconds

2ND SET-UP: 10 operations—1 minute, 7 seconds

COMMENT: Less than 2 minutes machine time for 24 cuts. Tubing strong and tough to cut; thin wall, difficult to hold concentricity. Wall thickness and thread must be uniform to close tolerances, to pass Government tests.

THE NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO



ACME-GRIDLEY BAR and CHUCKING AUTOMATICS built in 1, 4, 6 and 8 spindle styles, maintain accuracy at the highest spindle speeds and fastest feeds modern cutting tools can withstand.

NEW PRODUCTS

FOR ADDITIONAL INFORMATION regarding any of these items, please use coupon on PAGE 60

F-53—Storage Batteries

Introduction of a line of Heavy Duty DeLuxe batteries has been announced

by the Willard Storage Battery Co., Cleveland, Ohio. They are being produced in the five sizes that fit more than 99 per cent of the cars on the road

today. The new sizes are 2, 2L, 2F and 2E—size one has already been marketed. Features of the line are an advanced plate design and greater cranking power. A new sealing compound that will not melt in high underhood temperatures and a newly-designed hard rubber container—reinforced at points of stress to resist softening and bulging when subjected to extreme heat—are other features of the Heavy Duty line.

PRECISION PARTS

As long time manufacturers of jig bushings and components for diesel engine parts, cam rollers, etc., we are equipped to produce a wide variety of similarly related precision parts. Our facilities include automatic blanking, heat treating, centerless and cylindrical internal and external grinding, a variety of honing and lapping machinery—and the most modern types of precision inspection equipment. Our Engineers are well versed in the processing of correct steels for specific applications—making due allowance for shock resistance and wear and abrasion—as well as for cost.



Hardened Roller



Precision Paper Slitter



Special Bushing
for diamond
dressing
attachment



Hardened punch
holder Bushing



Diesel piston pin



Aircraft Plunger
Assembly

Your inquiries will have prompt and competent attention

ACCURATE BUSHING COMPANY

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The Standard Die Supply, Inc.		The Stone Company, Inc.			
TOOL & DIE SUPPLY	PHILADELPHIA, PA.	RHINEBECK, N. Y.			
B. J. Andrews, Inc.	Albert R. Dorn	Frank A. Hart			

F-54—Copying Machine



Introduction of this low-cost Copyflex machine, model 20, for making copies in all phases of business and industry, has been announced by the Charles Bruning Co., New York. The Copyflex machine offers a 46-in. printing width with exposure speeds up to 95 ipm. It is a medium volume machine filling out the Bruning Copyflex line of five other models. Model 20 utilizes 60-cycle, 115 volt, alternating current.

F-55—SO₂ Pollution Analyzer

The Thomas Autometer—manufactured by Leeds & Northrup Co., Phila., for automatic analysis and recording of air pollution by SO₂—is now available as either an integrating or non-integrating assembly, complete with Speedomax electronic recorder. Integrating Autometer continuously records actual concentration of sulfur dioxide in parts per million, records average concentration integrated over a ½ hr period, automatically checks its

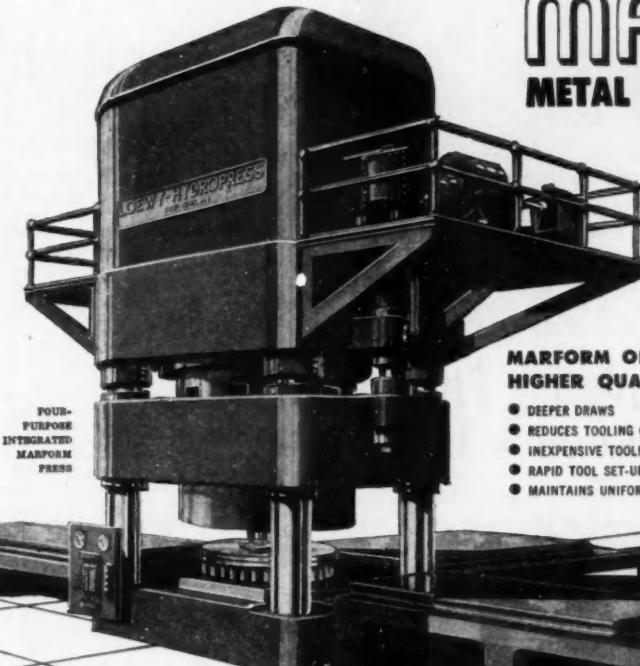
(Turn to page 74, please)

WE HELP YOU PRODUCE WRINKLE-FREE PARTS

AND CUT PRODUCTION AND TOOLING COSTS BY **50%**

MARFORM

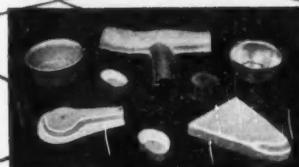
METAL FORMING EQUIPMENT



FOUR-PURPOSE
INTEGRATED
MARFORM
PRESS

MARFORM OFFERS GREATER ECONOMY PLUS HIGHER QUALITY AND FASTER PRODUCTION

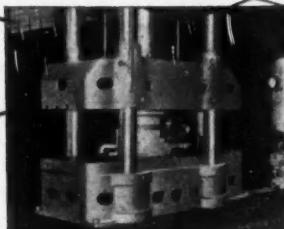
- DEEPER DRAWS
- REDUCES TOOLING COSTS
- INEXPENSIVE TOOLING CHANGEOVER
- RAPID TOOL SET-UP
- MAINTAINS UNIFORM WALL THICKNESS
- UNIFORM STRAIN DISTRIBUTION
- PROVIDES UNMARRED EXTERIOR SURFACE
- ADAPTABLE FOR HOT FORMING
- WRINKLE-FREE TAPERED DRAWING
- REDUCES FINISH HAND FORMING
- SAME TOOLS REGARDLESS MATERIAL SPECIFICATION OR GAUGE



A few of the three thousand different aircraft parts Marformed in one company alone

INTEGRATED PRESS UNIT WORKS FOUR WAYS:

- For Single Acting Dies
- For Double Acting Dies
- For the Guerin Process—complete with Tables
- For Marforming—each size available with many pad sizes



Marform Package Units are readily installed in existing presses such as this 750-ton press at the Republic Aviation Corporation.

LOEWY-HYDROPRESS MARFORM PRESSES can easily be changed over to accommodate work of a varied nature. Guerin Pad Loading Tables can be mounted left and right allowing freedom for Marforming and conventional die work. Marform Pads are readily interchangeable to meet your specific pressure and blank size requirements.

BUILT IN
COOPERATION WITH
HYDROPRESS, INC.,
NEW YORK, NY

Ask for literature No. 619

LOEWY

216 EAST 49th STREET, NEW YORK 17, N. Y.



Holcroft furnace for carbo-nitriding bulk-loaded automotive parts. Has automatic quench and draw.

CARBO-NITRIDING

A Superior Case-Hardening Process

Developed by HOLCROFT

CARBO-NITRIDING provides a "gas cyanided" case by heating the work in a controlled atmosphere composed of generator gas, hydrocarbon gas and ammonia. This Holcroft process uses continuous-type furnaces such as the unit shown above, and offers these advantages:

- 1 Low operating cost—often as low as one-fourth that of liquid cyaniding.
- 2 Superior wear resistance—greater than with carburizing.
- 3 Greater depth of hardenable case obtained per unit of time than by carburizing at the same temperature.
- 4 Minimum distortion through low-temperature operation and slow cooling when required.
- 5 Applicable to both plain carbon and alloy steels.

Although the theory behind carbo-nitriding is mentioned in a patent issued in 1883, it was not applied to high-production furnaces until rediscovered independently by Holcroft & Company in 1936. The first furnaces of this type, built 15 years ago, are still in operation; many other production furnaces installed since then have further proven the merits of this process.

You, too, can take advantage of this metallurgical leadership. Write today for complete information.

BLAZING THE HEAT TREAT TRAIL



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Walker Metal Products, Ltd.
Windsor, Ontario
EUROPE
S. O. F. I. M.
Paris 8, France

NEW PRODUCTS

For additional information please use coupon on page 60

(Continued from page 72)

"zero reading" every 30 min, and marks off each cubic foot of air sampled. Non-integrating assembly is of simpler design, providing only the continuous record of SO₂ concentration for applications where this information is sufficient.

Range of the equipment is cipher to five parts SO₂ per million. Changes in concentration as small as a few tenths of a part per million can be readily detected. As a means of measurement, a continuous sample of air is passed through a solution which absorbs SO₂, causing a change in the electrolytic conductivity of the solution.

F-56—Hydraulic Valve

For high pressure hydraulic circuits used for long cycling operations, the Denison Engineering Co., Columbus, Ohio, has developed a pilot operated valve that utilizes system pressures. Solenoids are used only to operate small internal pilot valves.

The valve is designed so that the spool always moves at the same rate of speed regardless of operating pressures. It is available in $\frac{1}{4}$ in. and $1\frac{1}{2}$ in.



Denison hydraulic operated valve.

in. sizes, in both single- and double-solenoid types, with provision for either external or internal pilot connections.

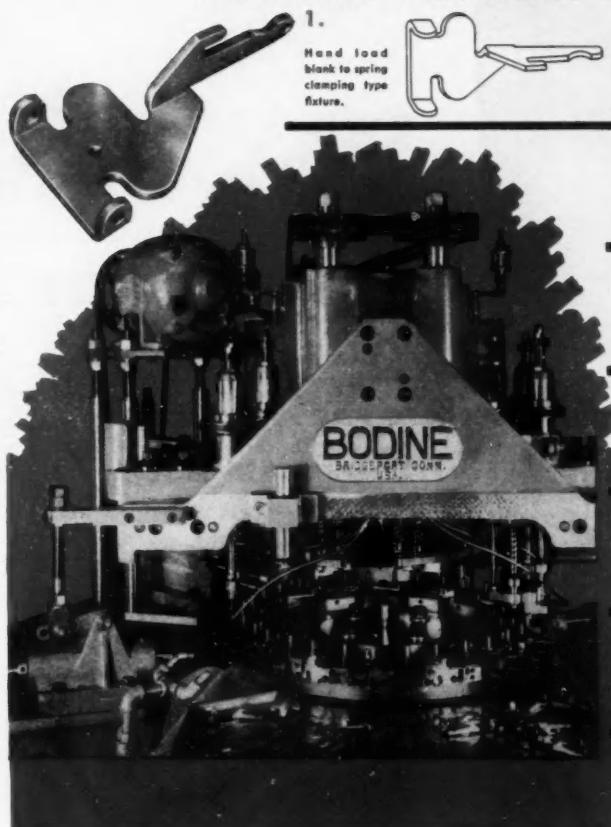
Eight types of spools provide for eight different porting combinations. In the double solenoid unit, the spool is automatically pressure-centered when the solenoids are de-energized.

F-57—Portable Air Grinder

An air grinder, produced by Ingersoll-Rand Co., Phillipsburg, N. J., has an added safety device to prevent overspeed operation and possible accidents. It contains a motor governor to maintain correct wheel speed, plus a built-in unit called the "overspeed safety coupler". (Turn to page 78, please)

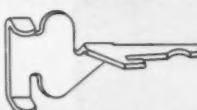
Bodine CASE HISTORY NO. 30

PROCESSING A MAGNETIC IRON VERTICAL ARMATURE



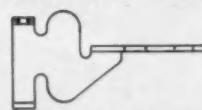
1.

Hand load
blank to spring
clamping type
fixture.



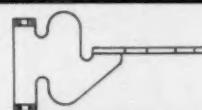
2.

$\frac{1}{8}$ drill—top ear,
vertical spindle.



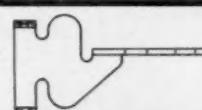
3.

$\frac{1}{8}$ drill—bottom
vertical spindle



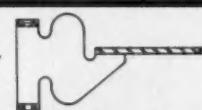
4.

C'sink top ear, verti-
cal spindle.



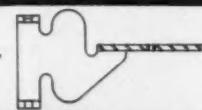
5.

No. 22 (.152) drill,
vert. spindle.



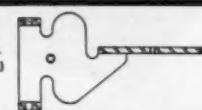
6.

No. 55 (.052) drill,
vert. spindle.



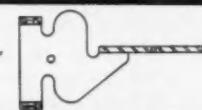
7.

.1565 $\pm .0005$ —vert.
spin., No. 38 (.1015)
drill, hor. spin.



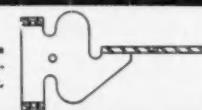
8.

C'sink bottom ear,
inverted spindle.



9.

No. 30 (.1205) ream
—thru both ears with-
in .002 alignment,
vert. spin.



10.

Automatically eject.

THE

Bodine

C O R P O R A T I O N

BRIDGEPORT, CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING,
TAPPING, AND SCREW INSERTING MACHINES



Life-linestarter
PAIRED FOR PRODUCTION
Life-line motor



Insure

machine performance with this matched pair

Motors and controls can make or break the performance of your machine tools. Why speculate? Life-Lines assure peak performance under all conditions. Take these, for example:

Accidental blows to starters? Will false operations result? Not with the Life-Linestarter®. Its inverted clapper-type design provides positive operation.

Contact life? Life-Linestarter contacts last longer, why? Because the exclusive "De-ion"® arc quickly divides, confines, and extinguishes the arc. Contacts, therefore never need filing.

Bearing lubrication? Life-Line motors pre-lubricated, sealed-for-life bearings eliminate this problem. These bearings need no lubrication. And

because they are sealed, there's less chance for grit and dust to harm the bearings.

Physical abuse? Falling objects, excessive vibration, corrosive atmospheres—all take a heavy toll of weak motor frames. Thousands of installations have proved that Life-Line's steel frame stands up to physical and chemical abuse better than conventional frames. Steel adds strength without additional weight.

Consider the many other features of this motor and control production team—"paired for performance." Your Westinghouse representative has the facts. Ask him for copies of "Life-Line Motor Book" B-3842 and "Tomorrow's Starter Today" B-4677. Or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.
J-21638

YOU CAN BE SURE... IF IT'S

Westinghouse

Life-Line

MOTORS and CONTROLS



NEW PRODUCTS

For additional information regarding any of these items, please use coupon on page 60

(Continued from page 74)
pling." This coupling automatically uncouples the arbor and the grinding wheel from the motor, making it impossible to operate the grinder until

the cause of overspeeding has been corrected. Another safety feature of the grinder is a multiple exhaust system to direct the exhaust away from the work.

Exclusive features protected by U.S. patent Nos. 1958725, 2140818 and 2230471.



The unrivaled service life of Aetna T-Type Clutch Release Bearings has always made them the most economical in the long run. Once installed they are trouble-free, attention-free for vehicle life. Thanks to their patented design and self-lubricating features there's no need of costly machining operations for oil lines or grease fittings—no need of further maintenance whatsoever. Think what that saves in man and machine hours on the assembly line, in saving upkeep costs for the vehicle owner.

It's a trusty sign of dependability and economical performance in any vehicle—the famous Aetna T-type bearing. Investigate. Find out the many other sound reasons why Aetnas deserve a place in your specifications.

AETNA BALL AND ROLLER BEARING COMPANY • 4600 Schubert Avenue • Chicago 39, Illinois

Aetna

In Detroit: SAM T. KELLER, 2457 Woodward Avenue
T-TYPE Clutch Release BEARINGS
WITH THE... ...THAT TAMES TROUBLE

Other construction features provide 20 per cent more power and lighter weight than previous models. An independently mounted arbor, has widely spaced, permanently lubricated, arbor bearings.

It is available for 8-in., 6-in., or 5-in. wheels, running at respective motor speeds of 3100, 4100 and 4500 rpm. Overall length is 24½ in. with straight handle and 22½ in. with grip handle. The grinder has a maximum side to center distance of 2 5/16 in. and weighs approximately 16½ lb.

F-58—Fuel Pressure Regulator



Schneider Carburetor Co., St. Louis, Mo., has developed a fuel pressure regulator, applicable to all cars and trucks. The device is installed in the gasoline fuel line between the fuel pump and the carburetor. It reduces fuel pressure and evens fuel pump pulsations of gasoline in the fuel line, making the flow of gasoline more uniform and constant when it enters the carburetor.

F-59—Tote Bin Lift Truck

Another addition to the Lewis-Shepard Products, Inc., Watertown, Mass., Master line of materials handling equipment is a Jackstacker especially made for handling tote bins. This lift truck

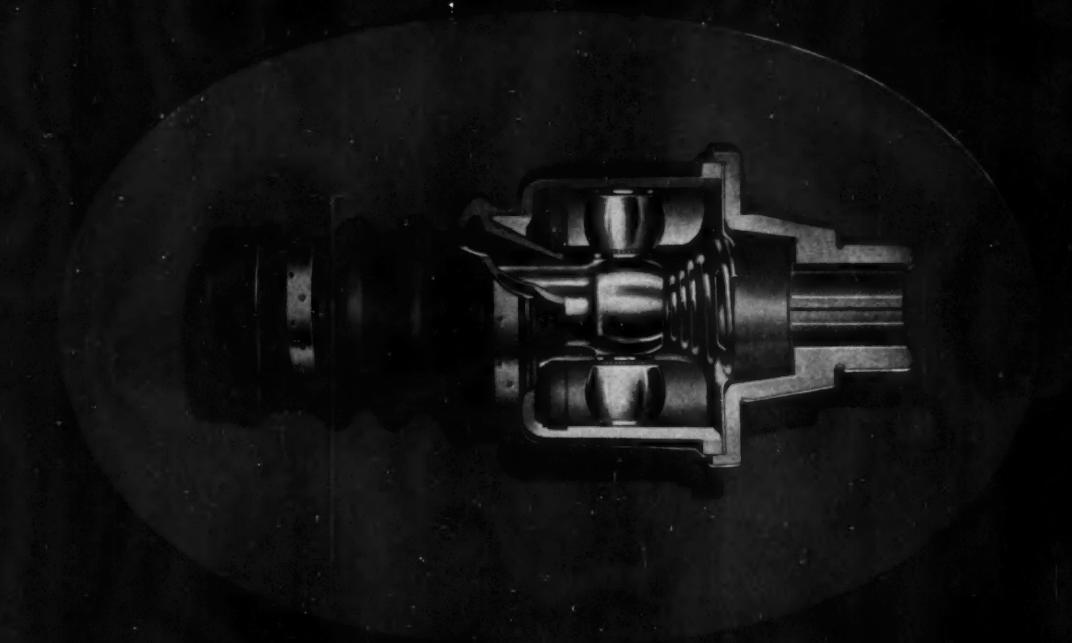


Lewis-Shepard tote bin lift truck, the Master Jackstacker.

is made in telescopic and non-telescopic models having a capacity for 4000 lb loads up to 48 in. long. The non-telescopic model has a fork elevation of 53 in. and the telescopic model has a fork elevation of 77 in. so that the tote bins can be double-decked in storage areas.

(Turn to page 80, please)

Exclusive "DETROIT" Ball and Trunnion Universal Joints...



...Minimize Thrust on Supporting Bearings

The revolutionary design of the "DETROIT" Ball and Trunnion Universal Joint practically eliminates spline friction. This means that thrust loads on transmission and axle bearings are minimized. The result is not only less wear on universal joint bearings, but also longer life for the entire automotive drive train.

Detroit

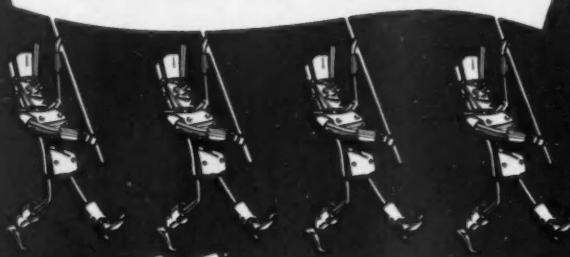


UNIVERSAL JOINTS



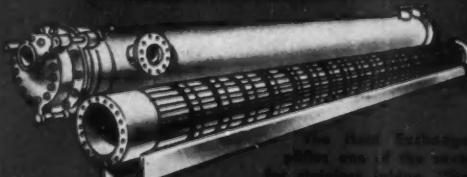
UNIVERSAL PRODUCTS COMPANY, Inc., Dearborn, Michigan

Keep in Step with—
**RIGID GOVERNMENT
 TUBING REQUIREMENTS**



SPECIFY "Standard"
 for Welded Stainless Steel Tubing

THE STANDARD TUBE CO., INC.



The Standard Tube Co. is one of the leaders in stainless tubing. "Standard's" stainless tubing meets this, as well as many other difficult requirements for strength, and heat and corrosion resistance.

Deal with the Specialist among Specialists

A tubing specialist, like other specialists, knows his trade well.

When you deal with "Standard," you deal with a tubing specialist who manufactures millions of feet of tubing every month from stainless and carbon steel—and for

25 years has been serving all types of industries for mechanical and gas-carrying applications.

If you need stainless tubing, be sure you specify "Standard." It pays to deal with the tubing specialist among specialists.

Stainless Tubing Size and Thickness
 ½" O.D. to 3" O.D.
 .028 to .095 wall
Carbon Steel Tubing:
 ½" O.D. to 5½" O.D.
 .028 to .260 wall

THE STANDARD TUBE CO.

Detroit 7, Michigan

Welded Tubing Fabricated Parts

STANDARDIZE WITH STANDARD — If Possible



**NEW
 PRODUCTS**

For additional information please use coupon on page 60

(Continued from page 78)

Lifting forks are constructed with an 11-in. opening to provide clearance on each side of tote bin tilt racks. A special lifting arrangement enables the tote bins to be tilted on the tilt rack by the Master Jackstacker in addition to the usual functions associated with this type equipment.

Both front and rear wheels, as well as stabilizing casters are rubber tired. It has two speeds forward and reverse, electric lift and lowering, and the spring-set, electrically released brake. All controls for the above functions are in the handle head and can be operated with the handle in any position including vertical.

F-60—Carbide Drill



A carbide drill, developed by the Raymac Mfg. Co., Detroit, has a different flute shape and pointing. The Raymac $\frac{1}{4}$ in. drill, drilling steel of 50-65 Rockwell "C", operates at its highest efficiency at 350 rpm, while a $\frac{1}{2}$ in. Raymac drill, drilling the same material, shows its best performance at 200 rpm.

F-61—New Flux and Soldering Process

Called the "Coronil soldering process," a new soldering process for use in manufacture of automotive radiators and other heat exchange equipment has been developed by McCord Corp. of Detroit, Mich., in cooperation with Mathieson Chemical Corp. of Baltimore, Md. Its chemical-metallurgical method employs a new series of soldering fluxes bearing the trade name M.C.C. which were discovered by McCord and developed cooperatively with Mathieson. These M.C.C. fluxes are suitable for use in joining most of the commonly used metals and produce solder bonds of highest strength, leave no corrosive residues and eliminate corrosion of plant equipment.

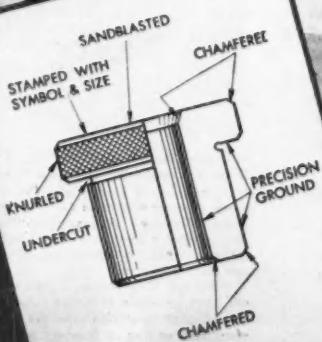
M.C.C. fluxes are made from hydrazine, a Mathieson chemical first used on a large scale as a rocket fuel by the Germans in World War II, and since finding commercial application in the pharmaceutical, agricultural, metal finishing and synthetic fibre fields. The fluxes are available from Mathieson through an arrangement with McCord.

(Turn to page 82, please)

Look for These Features
in Drill Bushings

EX-CELL-O
HAS THEM ALL

- MATERIAL—premium grade tool steel selected for greatest wear resistance.
- FINISH—precision ground inside and out, and under the head for perfect bearing.
- CONCENTRICITY—assured by grinding on arbors after the holes are finished.
- HARDNESS—hardened to 62-64 Rockwell "C" on accurately controlled equipment.
- UNIFORMITY—of material, dimensions, finish, and hardness assure accuracy, long life for both bushings and tools.
- PROMPT DELIVERY—from stocks of standard sizes in Detroit, New York, Los Angeles, and Toronto, Canada.
- PREFERRED—largest bushing users in the country are Ex-Cell-O customers.



XLD
EX-CELL-O CORPORATION



Your purchasing and engineering departments should have copies of this Ex-Cell-O Bushing Catalog No. 35371. Just ask for the number of copies you would like.

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS
RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT
AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

NEW PRODUCTS

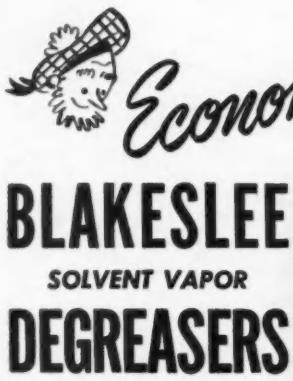
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(Continued from page 80)

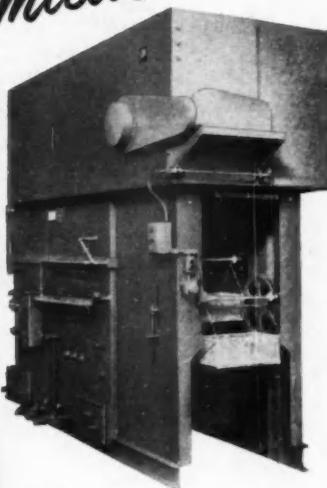
F-62—Divided Platform Power Truck

A low-lift platform-type power truck

with platform built in two sections has been developed by Elwell-Parker Electric Co., Cleveland, Ohio. It was designed to meet special requirements, part of a load being suspended between the platforms, and also for use as an



USE LESS SOLVENT



BLACOSOLV
Stabilized Degreasing
Solvent — one price
one solvent for all metals

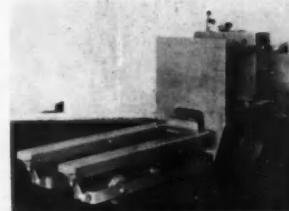
NIAGARA

Metal Parts Washers
for use with cleaning
compounds on either
batch or production jobs

Blakeslee Solvent Vapor Degreasers
USE LESS SOLVENT because of the
 patented construction and opera-
 tional features. Metal parts are made
 chemically clean and dry in just a few
 seconds. Save time, labor, rejects with
 a Blakeslee Solvent Vapor Degreaser.
 A Blakeslee engineer-trained repre-
 sentative is available to solve your
 specific degreasing problems.

ordinary platform truck in handling standard skids and tote boxes.

This dual purpose was achieved by dividing the forward trail axle. Each of two trail wheels has a separate axle mounted in its individual frame. Platforms are joined at their rear ends in a rigid structure, enabling them to be raised or lowered simultaneously as a unit by mechanism similar to that in



Elliott-Porter low-lift platform truck

other Elwell-Parker low-lift platform trucks. Their forward ends are connected to the wheel frames by forged steel links and the platforms retract as they are raised.

In lowered position the platform flanges come down at the sides of the wheel frames. Platforms are 6½ in. wide, 63 in. long, and placed 14 in. apart. Lowered, they are 10½ in. above floor; raised maximum height is 15 in. These trucks are powered all-electric or gas-electric and capacities are 2000, 4000 and 6000 lb.

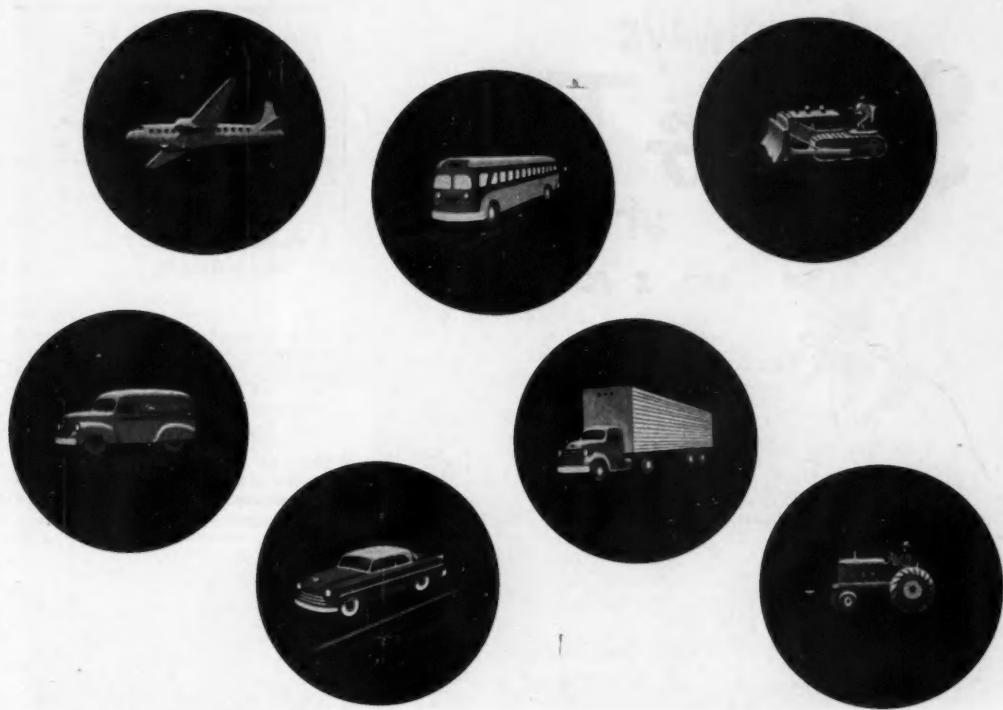
F-63—Lightweight Spray Gun



Introduced by the DeVilbiss Co., Toledo, Ohio, is a lightweight spray gun. Identified as type TGA, it is designed for a wide range of spray work from touch-up to complete refinishing. A fingertip adjustment control quickly provides a wide selection of spray patterns for various types of jobs and paint materials.

Weighing 13½ ounces, it has the ball-and-cone principle of nozzle construction. For efficient operation, the gun requires about four or five cu ft of air per minute at 40 lb pressure.

(Continued on page 84)



WHATEVER THE BATTERY NEED THERE'S AN EXIDE FOR THE JOB

The Exide line of automotive batteries is complete. There are Exide Batteries for gas and diesel engines . . . for automobiles, trucks, tractors, buses, off-the-highway equipment, aircraft, motor boats. And in each classification you will find the right type, size and capacity to fit your specific requirements.

Back of all Exide Batteries are years of continuing research-engineering and a broad battery-building experience that is unequalled in the industry. **To you this means: when you buy Exide Batteries, you buy top-high battery**

performance in all climates, long battery life, low cost maintenance.

Factory-fresh batteries are assured by the vast, widespread Exide organization which includes 19 strategically-located manufacturing and assembly plants. Exide engineers will be glad to work with you on any of your storage battery problems.

THE ELECTRIC STORAGE BATTERY COMPANY

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1888...DEPENDABLE BATTERIES FOR 63 YEARS...1951

It's always
SPRING TIME
 at
NO. 2 JOHN ST.



In fact, we at American-Fort Pitt Spring have been making coil springs—all kinds, hot or cold wound—spring, summer, fall and winter, for more than sixty years. Over the years our engineers have worked on almost every conceivable type of spring problem. In many instances their recommendations have helped cut production costs and improve product performance. The springs we furnish are delivered precisely as specified and in conformity with highest standards. When you need springs, the No. 1 place to think of is No. 2 John Street.

AMERICAN-FORT PITT SPRING DIVISION

H. K. Porter Company, Inc.

No. 2 John Street, McKees Rocks, Pa. (Pittsburgh District)

**AMERICAN-FORT PITT
SPRINGS**

**NEW
PRODUCTS**

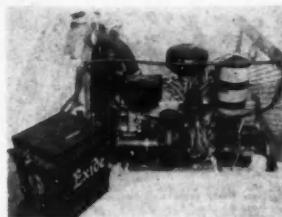
For additional information please
use coupon on page 60

(Continued from page 82)

**F-64—Spark Enclosed
Gasoline Truck**

Designed to provide maximum possible safety operation in gas and dust laden areas, gasoline fork trucks in spark-enclosed models are now available from Phila. Div. of Yale & Towne Mfg. Co., Phila., Pa. Trucks are designated as Underwriter's Laboratories Type GS.

Protection has been accomplished by shielding the electrical equipment against sparking, by providing a water type exhaust manifold, a water cooled muffler, and static conductive tires. Trucks so equipped will not readily be



Yale & Towne spark-enclosed gasoline truck

a source of ignition of any vapor due to electrical sparks, hot metal surfaces, exhaust gases, or backfires.

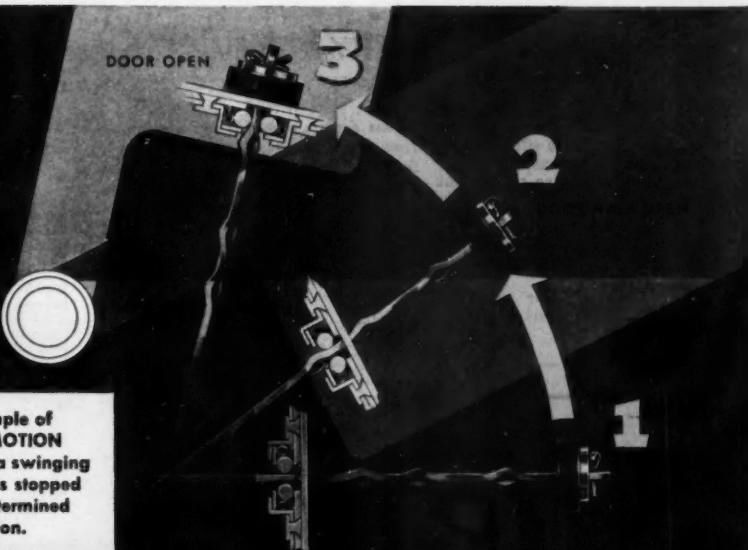
Fuel tank is of heavy welded steel construction, surrounded by strong structural members as protection against rupture. A special filler cap which seals automatically is shielded from the engine compartment so overflow cannot drop on the electrical system or hot engine parts.

Fuel lines are copper tubing and gasoline filter bowl is all-metal, assuring no shaking loose even under severe vibration. Fuel lines are supported throughout and so located that if they do leak, gasoline will not drop on hot engine surfaces.

An up-draft carburetor with a leak tight metal air horn is connected directly to an air cleaner of the back-fire arrestor type. The exhaust manifold has a water jacket designed to keep exhaust system and engine surface temperatures low.

Muffler is a water type which quenches sparks in the exhaust by directing them against a water spray. Even in the event that water is left out of the muffler, spark arrest is said to be still effective.

(Turn to page 86, please)



An Example of
CHECK MOTION
...in which a swinging
movement is stopped
at a predetermined
position.

If it needs to behave like a latch, a lock, or a linkage...
we can create it...mass produce it...WITH STAMPINGS!

You'll recognize the symbolic illustration above as an automobile door check application. We not only produce these and other "motion devices" for passenger car and truck doors...but also for station wagon tail gate supports and for rear door checks on panel trucks.

Our specialty is mass producing such assemblies—with stampings. Because we can make precision stampings of uniformly high quality and machine-assemble them in large volume, we are able to keep the prices unusually low. That's only one reason why

Standard is a leading supplier of door checking and latching equipment for the automotive industry.

We can design and produce door latches and strikers of all types, latches for deck lids and hoods—for either civilian or military equipment in the automotive and aircraft fields. Why not call us, or write for a copy of our new booklet, "We Make Motions".



THE REID DIVISION OF



The Standard Products Co.

DEPT. G, GENERAL OFFICES: 2130 WEST 110 STREET • CLEVELAND 2, OHIO

DETROIT SALES OFFICE: 316 FISHER BUILDING, DETROIT 2, MICHIGAN

WE MAKE MOTIONS

News of the Machinery Industries

(Continued from page 51)

It is claimed that existing facilities are adequate. Concerning the effect of current restrictions on the use of metals for plating, the committee stated that any further reduction in the availability of copper will seriously handicap the industry.

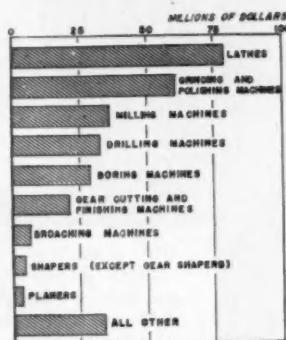
Conveyor Output?

Output of the conveyor manufacturers may be hit by steel shortages

unless some assistance is forthcoming from the NPA. It all stems from difficulties in placing orders for steel against advance CMP allotments for the fourth quarter. Industry representatives on the Conveyor Equipment Mfrs. Industry Advisory Committee were told by the NPA that it could not approve a previous request to permit the conveyor industry to have a larger inventory of steel than allowed by

NPA Order M-1. Requests for assistance can be considered only on an individual company basis, according to NPA officials.

Machine Tools—1950 Shipments of Major Types



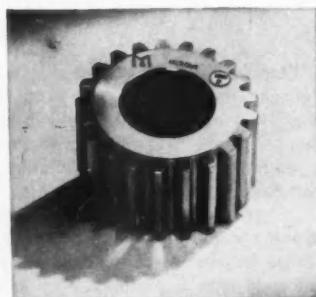
We're
Up
To
Our
Ears

...and we
like it
—and we
know what
caused it...



At IGW, your precision gear problem is engineered and scheduled efficiently —then produced on modern equipment operated by skilled craftsmen—and controlled by rigid inspection.

*Result . . .
... you like it—and you know what caused it.*



This planet pinion has .0003 MICROWN*—IGW's new after-grinding, high precision crowning process.

*PATENT PENDING



Indiana GEARS
GEARS - CAMS - INTRICATE AND
PRECISE MACHINE PARTS
INDIANA GEAR WORKS • INDIANAPOLIS 7, IND.

Standardization

At the recent Council of the International Organization for Standardization (ISO), a standard reference temperature of 20 C., or 68 F., was established for the measurement of mechanical gages. This is for limit gages as generally used for the inspection of component parts. Since these parts and the gages change in size with variations in temperature, it is necessary to have general agreement on the temperature at which their sizes will be acceptable.

Latest industry totals on certificate of necessity approvals for 341 machinery and component manufacturers amount to \$301,874,000 proposed investment with a \$206,258,000 tax amortization allowed for a 68.3 per cent tax amortization allowed in relation to the proposed investment.

New Products

(Continued from page 84)

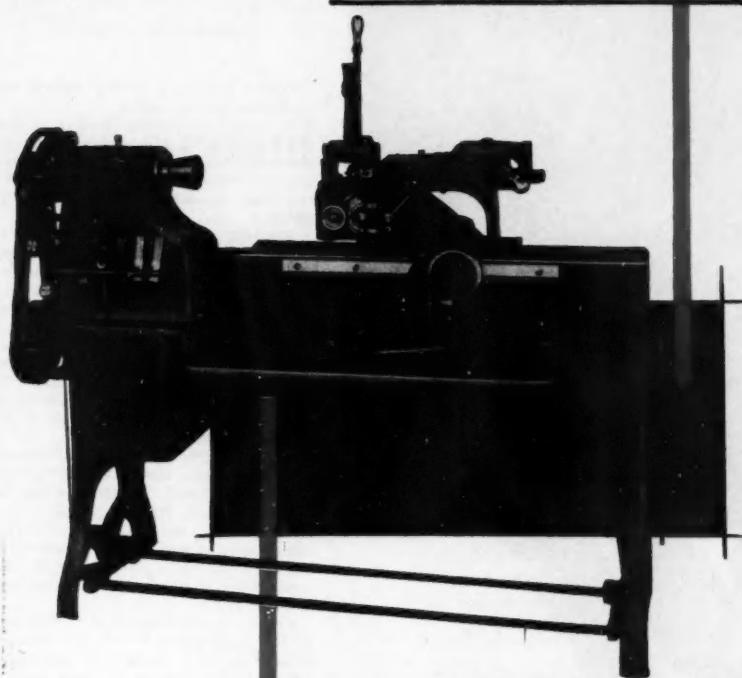
All low tension wires and cables are enclosed in flexible non-metallic tubing with metal enclosures to receive wires and terminal connections. All wires and cables are securely held to prevent chafing due to vibration and are located with safe clearance from any moving parts, hot engine surfaces, exhaust and fuel system lines.

All high tension wires are enclosed in flexible metal tubing that is grounded wherever wires pass through metal surfaces.

Spark plugs are enclosed to prevent possibility of sparking between terminals and plug bases due to moisture or dust.

Generator, starting motor and relays are totally spark-enclosed with a cover over the terminal posts to prevent accidental sparking from a tool or metal object.

Hanson-Whitney Rapid Precision Centering Machine



**a machine
you can use!**
**a price
you can pay!**
**delivery
you'll like!**

Here's the machine that precision centers almost any part with a machined finish — round, square, ball-ended, tapered — up to $3\frac{3}{4}$ " diameter. A variety of parts machined from the bar on automatics or semi-automatics can thus be centered quickly, accurately for subsequent grinding, milling, or special threading operations.

Centers are first drilled and then shaved, on one side only, to insure absolute accuracy, an operating feature that reduces the amount of stock allowed for finishing operations. A simple treadle arrangement leaves operator's hands free for speedy work handling.

This efficiently designed machine costs little, delivers the work fast. A note on your company letterhead brings an 8-page detailed bulletin by return mail.

HANSON-WHITNEY COMPANY • HARTFORD 2, CONN. • DIVISION OF THE WHITNEY CHAIN COMPANY



7HW51



Hunting for someone who can
hand you Plaskon Alkyd parts?

Whether you need a tote box full of parts—or
box cars full—we can produce them. We'll take design-
ing, tooling, and other chores off your hands, too. If you
need parts with the excellent characteristics

of Plaskon Alkyd, our fact-and-figure men are
eager to talk with you. Just write, wire, or phone.

Or if you prefer, our plane and pilot will speed you
here for a time-saving chat about your parts problems.

No obligation, of course.

when you look for
plastic moldings,
look first to . . .



Plastic Research Products, Urbana, Ohio

Six-Press Setup

(Continued from page 62)

knockout occurs. This tray deflects the workpiece into a chute.

A second redrawing is done at the third station, loading and other operations being the same as at the prior station. This die also includes a rocking tray to deflect the part into a chute.

Piercing of a central hole is done in the fourth press setup after loading with a fork, but, in this case, the flange is up and the punch is in the upper half of the die. The pierced-out slug drops through the die into a chute and into a tote box in front of the press, but the workpiece, picked up by the punch, is stripped from it at the top of the stroke and falls on a rocking tray that deflects it into a chute at the back of the press.

In the fifth operation additional drawing is done, this being around the hole just pierced. Again, loading is done, by a fork, over the punch in the lower die half, the flange of the workpiece being down. As the workpiece sticks in the upper die, it is elevated, knocked out and deflected by a rocking tray, as before.

Final shaping consists of a restrike in the sixth press to set the dimensions of the draw made in the prior operation. Handling is the same as in the fifth operation and a rocking tray deflects the ejected workpiece into a chute as before. Finished stampings fall into a tote box.

All six presses run continuously unless stopped by the operator, but each operator has ample time for loading the workpiece. In no case does the operator put his hands inside the guard that encloses the die but (except at the first station where a magazine outside the cage is employed) uses a loading fork. All ejection of workpieces is automatic. These conditions afford maximum safety and the new line is regarded as closely approaching the ideal from this standpoint. The presses themselves are also protected by limit switches so arranged as to stop them automatically if the tray-operating mechanism should fail to withdraw the tray in time to clear the upper die.

Readers of
AUTOMOTIVE
INDUSTRIES
are always
WELL
INFORMED

If broaching isn't the answer, we'll tell you, too.....

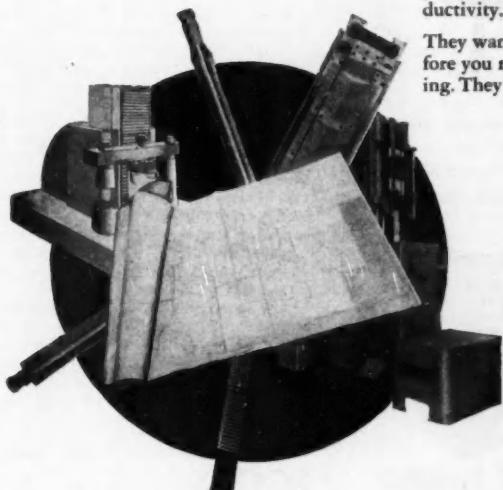
The fact that broaching accurately removes metal faster than any other process does not make it a panacea to increase the productivity of ANY operation.

Naturally we want to see broaching used wherever possible. But, today especially, with productivity for defense so vital, we *don't* want to see it used where it shouldn't be used and we *do* want to see it used to its maximum effectiveness.

Colonial's broaching specialists have been through the mill for years on practically every kind of broaching job there is. They know where broaching can and cannot be used effectively. What is more, they know HOW it can be used MOST effectively.

They have learned the hard way that the wrong broach, fixture or machine—even if it costs a few dollars less—is poor economy. It costs more in the long run, cuts productivity.

They want to help you make doubly sure you are right before you release an order for broaching equipment or tooling. They will check your requirements without cost to you.



For Your Tool Room

A wall or bulletin board poster of DO and DONT items that should help you reduce broach maintenance cost. No charge. Ask for BN-1250.

New Aluminum Casting Alloy

(Continued from page 58)

ments, the most advantageous minor additions were found by test to be 0.3 per cent manganese, 0.3 per cent chromium, 0.5 per cent vanadium.

The alloy chosen from the experimental melts had considerably higher short time 600 F tensile properties than any other aluminum alloy in general usage. The manner of fracture at temperature was similar to a normal ductile material at room tempera-

ture without the notch effect of surface tear. The room temperature properties were good, and the toughness as indicated by impact tests was satisfactory. The room temperature properties were similar to Y alloy (142), and the casting properties did not differ too much. The microstructure was considered to be ideal. It consisted of a strong matrix or solid solution material reinforced with partially

cellular network constituents. The name given to this casting material was ML aluminum alloy.

ML alloy can be heat-treated with a considerable gain in room temperature and 400 F properties. However, usage at 600 F destroys the effect of heat-treatment. After solution heat-treatment at 950 F for two hr, quench, and age at 250 F for 40 hr, room temperature tensile strengths of 42,000 to 46,000 psi were obtained. The properties in this respect were somewhat similar to Y alloy (142). The room temperature tensile strength of the alloy after stabilization at 600 F was 29,000 psi. Temperatures above 650 or 700 F reduce the room temperature strength to 26,900 psi, the lowest found for this alloy.

All of the results reported so far were made on test bars as-cast with skin on. Removal of the as-cast skin reduced the ultimate tensile strength at 600 F from 1000 to 2000 psi, the lowest reported being 15,000 psi with 6.5 per cent elongation in two in. No definite reduction in properties was noted when skin was machined from the test bars and then tested at room temperature. Test bars machined from a 3.5-in. diameter casting were found to have 600 F tensile strength of 14,300 psi down to 12,200 psi with a minimum of four per cent elongation at the center.

The creep properties of Y alloy (142-T61) are slightly better than ML (as-cast or annealed) at 400 F, but at 600 F the ML alloy has the superior creep resistance. At a minimum creep rate of 0.0002 per cent/hr, 142-T61 will support a load of 2500 psi while ML alloy will support a load of approximately 4100 psi at 600 F.

Stress rupture tests indicate that ML alloy will support a load of 6600 psi for 1000 hr at 600 F, and by extrapolation, a load of 5300 psi for 10,000 hr at that temperature. Castings which may become overheated in service in the 650 to 800 F range follow a stress rupture curve at 600 F that is parallel to one that has been kept under 650 F, a critical point, but is approximately 500 psi less. Thus, an overheated ML alloy casting will support a load of 6100 psi for 1000 hr in stress rupture test at 600 F.

A summary of the properties of ML aluminum alloy is given in Table II. The alloy has tensile, creep, and stress rupture properties at 600 F, approximately 35 per cent higher than other alloys which have been used for elevated temperature service.

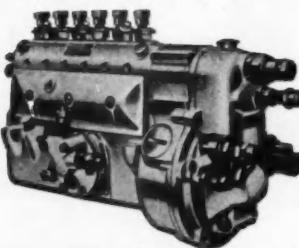


Confidence Abroad

Transport operators all over the world have learnt to trust this sign.

In any language the letters on the C.A.V. sign stand for first-rate service facilities, maintained by highly-trained craftsmen, using special precision equipment.

Wherever vehicles fitted with C.A.V. Fuel Injection Equipment are exported—whether to Trondheim, Santiago, Hong-Kong or Sydney—there's a service agent or depot to give it the specialist attention needed for such high-precision equipment.



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BOOKS . . .

BALL AND ROLLER BEARING ENGINEERING, published by SKF Industries, Inc., Philadelphia 32, Pa. Price \$1.75. The text covers in technical detail such subjects as bearing types and nomenclature, capacities, selection, design, installation, maintenance, causes of failures, and load calculations.

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COMPLETE Finishing SYSTEMS

for ENAMEL • LACQUER • PAINT

into the EXPERIENCE that goes
into the PLANNING and ENGINEERING
of MAHON EQUIPMENT is the item of
GREATEST VALUE to YOU!

General View of Complete Mahon Finishing System at Revco Inc., Deerfield, Michigan, Showing Cleaning and Rust Proofing Equipment at Left, Dry-Off and Finish Bake Ovens Above, and Hydro-Filter Spray Booths Right Foreground.

REVCO, INCORPORATED Acclaims MAHON FINISHING SYSTEM as WISE INVESTMENT!

The Complete Mahon Finishing System illustrated here was specially designed to meet the production requirements of Revco, Incorporated, Deerfield, Michigan, and to fit into the space available in the company's production layout. The system consists of a five stage Metal Cleaning and Rust Proofing Machine, Dry-Off Oven, three Hydro-Filter Spray Booths with a Filtered Air Supply Unit, and a Finish Bake Oven, designed and coordinated to apply the synthetic enamel finish to Home Food Freezer Cabinets and Component Parts—all of which are carried through the entire system on one continuous monorail conveyor. Like many other enthusiastic Mahon customers, Revco management is loud in its praise not only of the production capacity and the fine finish obtained, but of the manner in which the installation was planned, produced and erected. You, too, can turn your finishing equipment problems over to Mahon with complete confidence, because Mahon engineers have pioneered development in this highly specialized field for over thirty years . . . they are backed by a wealth of technical knowledge and practical know-how not available to you elsewhere. See Mahon's Insert in Sweet's Mechanical Industries File, or write for Catalog A-652.

THE R. C. MAHON COMPANY
HOME OFFICE and PLANT, Detroit 34, Michigan • WESTERN SALES DIVISION, Chicago 4, Illinois

Engineers and Manufacturers of Complete Finishing Systems—Including Metal Cleaning and Pickling Equipment, Metal Cleaning and Rust Proofing Equipment, Dry-Off Ovens, Hydro-Filter Spray Booths, Filtered Air Supply Systems, and Drying and Baking Ovens, Cure Ovens, Duct Collecting Systems, Fog-Filters, and many other Units of Special Equipment.

Parts Entering Mahon Five Stage Cleaning and Rust Proofing Machine with "Fire-Jet" Heating Units—Part of Revco System.

Tack Rag Operations Prior to Parts Entering Spray Booths at Revco Inc., Note Parts Emerging from Overhead Finish Bake Oven.

MAHON

INGENUITY can solve any problem



CASE HISTORY NO. 39-465982221

if YOUR
PROBLEM involves the
higher production of threaded parts
HY-PRO TAPS

can help you
to a solution



TOOL CO.
NEW BEDFORD, MASS., U.S.A.
Subsidiary of
Continental Screw Co.



Order from your distributor
or call the HY-PRO SALES ENGINEER

Two Stroke Diesels

(Continued from page 48)

Cylinder liner counterbores in the top of the block are deeper and carry steel inserts to facilitate seating of the liner. In addition, as illustrated, Belleville washer assembly ring seats on individual liners seal the combustion chamber.

Completing the picture of structural rigidity afforded by the new head and block, there is a new, stronger, more rigid and longer-lived crankshaft. Made of a steel forging, it is heat treated and boasts Tocco-hardened journals and pins. Fillets roll-burnished after grinding, and peened oil holes increase durability and freedom from fatigue to a major extent.

Added to these crankshaft features is the adoption of heavy duty precision type copper-lead bearings of the well-known "77" type for both mains and connecting rods, said to have a life expectancy of over 150,000 miles. In addition, the camshaft intermediate bearings have a new and heavier lock screw for improved retention.

Supplementing the new crankshaft, these engines boast the adoption of the familiar Houde viscous damper to control torsional vibration.

Longer life has been imparted to exhaust valves by Stellite-facing and by changing the seat angle to 30 deg from the former 45 deg.

Design of the injector rocker arm has been changed to a one-piece "pallet" type construction having better contact and longer life.

Both the No. 1 and No. 2 piston rings now are chromium-plated for increased life. Oil control rings of heavy duty type have been adopted and are said to reduce oil consumption to one-third of previous experience.

On 4-71 engines the oil pump now has positive gear drive instead of the former chain drive arrangement.

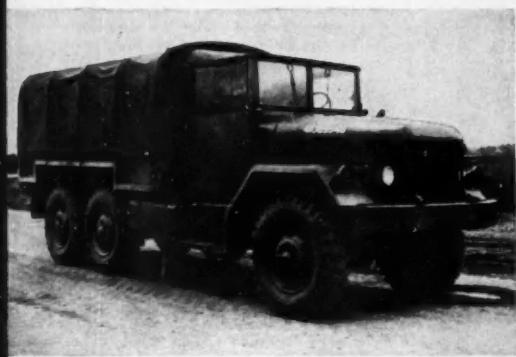
Incident to the adoption of the fuel modulator which gives positive control of fuel feed at low speeds, GMC will be able to recommend its Diesel trucks for low speed city delivery service for many vocational applications.

BOOKS . . .

METAL PROCESSING, 2nd Edition, by Orland W. Boston, published by John Wiley & Sons. This new edition of the well known text by Prof. Boston represents a revision as well as the introduction of considerable fresh material developed since the end of the war. Following the plan of the original text, this book provides a correlation of design of parts with materials and metallurgy, and the machines and tools used for their fabrication. New data on cutting fluids, machine speeds and feeds, surface quality, etc., has been included. Considerable attention also is given to the form and design of cutting tools as well as currently accepted nomenclature. One of the new chapters deals with drives for machine tools.



NEW TEN-TON CARGO CARRIER Designed and built at the Detroit Arsenal, this unique Model 51 Truck-tractor features a body design of extremely light weight in proportion to its load carrying capacity. Front and rear axles operate as independent unit for fuel articulation. South Wind "winterized"—a "978" heater keeps frost off the windshield . . . freezing cold outside the cab.



NEW REO "EAGER BEAVER" Army's newest six-by-six . . . 2½ ton heavy duty utility vehicle and cargo carrier. Can travel up 60° grades or under water. A South Wind "978" defrosts windshield, keeps cab and personnel warm.

NEW "ACK-ACK" GUN CARRIAGE Mounts twin 40 mm. anti-aircraft guns. Equipped with two South Wind "978's." One for personnel heating inside, and one in the gun turret to heat the turret components.



NOW...ARMY GETS "TROPIC" HEAT AMID "ARCTIC" COLD

Amazing New Military Heater Keeps Vehicles Warm Even at 70 Below!

Hard to imagine! The mid-summer, tropic heat inside these new military vehicles while outside temperatures range from 30 to 70 degrees below. And yet it's true. The result of a revolutionary new heater—the South Wind "978."

Simplified in design. Compact. This rugged forced air heater preheats, heats and defrosts in any type of military vehicle—in temperatures as low as 70° below zero. Dependably safe because the combustion air system is completely separated from the ventilating air stream. Always fast acting because warm air circulation doesn't depend on engine heat.

Built to Army Ordnance specifications, the "978" has been widely accepted by the Army for its winterization program. And because of its many exclusive advantages, promises to be influential in guiding future designs for commercial car heating, too.

REMEMBER: This is the only heating equipment available that meets winterization specifications for Ordnance vehicles. Write or call for information regarding your requirements. Get the experienced counsel of trained South Wind engineers. Address Stewart-Warner Corp., South Wind Division, 1514 Drexel Street, Indianapolis, Indiana.

STEWART-WARNER

PERSONNEL HEATING *South Wind*
ENGINE AND EQUIPMENT PRE-HEATING
WINDSHIELD DEFROSTING

Assembling and Testing Automatic Transmissions

(Continued from page 40)

support and rear band, the planet gears, the front pump, and the output shaft. Then the oil distributor, extension assembly, pressure regulator, front servo, oil capacity indicator, rear servo, main control body, converter housing, torque converter, oil pan, and air vent are installed. There are, of course, numerous other details in respect to the uniting of these members

into an efficient means of power transmission.

When a Fordomatic or Merc-O-Matic transmission comes off of the line, it then gets a simulated road test in one of the several Merz testing machines used for this work. Since the transmission must conform to rigid testing standards before being approved, the Merz unit had to be so designed

that it could put the transmission through paces similar to those which it might receive on the automobile.

The completed transmissions are tested just as rapidly as they come off of the production line so repeating defects will show up as soon as possible. All units are adjusted and oiled prior to the test.

For the test, Automatic Transmission Fluid Type A is used at a temperature of 180 F. Accurate tachometers are used for the driving motor of the machine and on the tailshaft of the transmission. Provisions are made to hold the tailshaft adapter and measure static torque in clockwise and counterclockwise directions. The unit is mounted in such a manner that the loads imposed on the structural components are similar to the loads in a car installation.

Testing procedure is started by advancing the input speed until the ammeter on the Merz reads approximately three amps. A reasonably constant speed is held while the operator checks the free rotation of the converter pump assembly. The selector lever is placed in the drive range and the throttle opening set at 20 deg. Quickly raising the input speed to 1500 rpm, observations are made—using the instruments on the machine—of the ability of both pumps to prime, current of the driving motor, front pump pressures and tailshaft speed. Any unusual noises are recorded by the operator.

With the selector lever moved to low, such items are taken into consideration as unusual behavior of the unit during the tailshaft speed, front pump pressure and unusual noise.

Input speed is then reduced to 750 rpm with the transmission still in low range. Again the front pump pressure and unusual noise conditions are noted. Unusually high amperage of the driving motor is also looked for.

The selector lever is then moved to reverse, input speed at 750 rpm, and once again the front pump pressure and noise conditions are checked. Output speed also is checked for this operation.

For the next test, in the same Merz machine, the throttle angle is slowly increased until oil pressure in the transmission reaches 150 psi. Any erratic behavior of oil pressure in the assembly during this test is cause for rejection. No unit, however, showing a defect, is removed from test immediately. If possible, a transmission having a malfunction is completely tested in order to gather data to diagnose the trouble and decide on the necessary repairs. A complete de-

Highest Precision HARDENED & GROUND PARTS

THE ball stud shown here is a perfect example of the precision methods and quality material that go into the production of all Brown Hardened and Ground Parts. Twelve separate operations are employed to produce this vital part. Every feature about this ball stud has to be right—every feature is. It has strength, wear resistance, precision fit, true-ground spherical and tapered surfaces, close inspection and strict uniformity.

Brown Hardened and Ground Parts have been serving the automotive industry for over 40 years. We refer you to any of our long list of satisfied customers. For information pertaining to your own requirements, simply write or wire.

Henry W. Brown

PRESIDENT



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SYRACUSE 1-4200

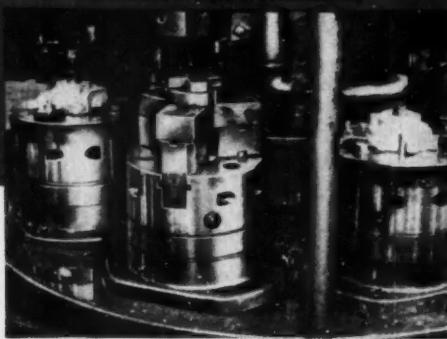
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The Well Known MULT-AU-MATIC METHOD

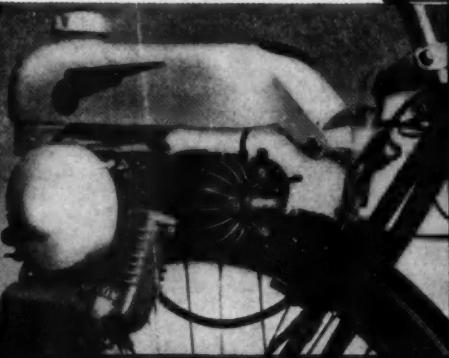
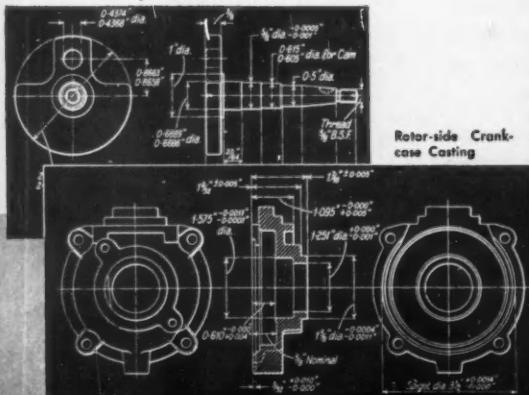
An excerpt from the
publication "English Machinery"

The Production of the MINI-MOTOR . . .

Machining Crank-shafts and Crank-case Castings by a Bullard Multi-Au-Matic Method.



Rotor-portion of Crankshaft



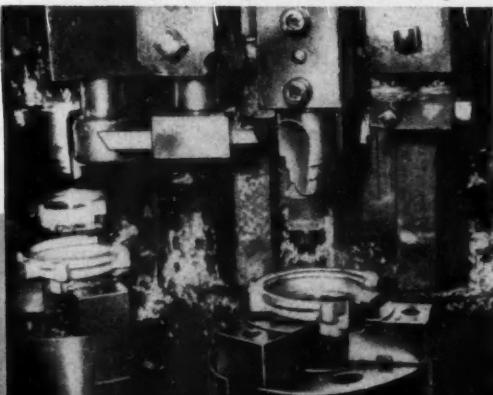
The Mini-Motor at Croydon Power Unit

"Methods employed at the Croydon Works of Trojan, Ltd."

Although the activities of Trojan, Ltd., are mainly concerned with the manufacture of Trojan vehicles, both in I.C.-engined and electrically-powered versions, the Trojan engine, diesel engines, and many other products, the Mini-Motor has now assumed a position of considerable importance in this programme. This unit, which is at present being produced at the rate of 1,000 a week, is shown above, and comprises a 49.9-c.c. 2-stroke petrol-engine and fuel-tank that can be attached to any ordinary pedal-cycle by means of a few simple fittings. The fuel-tank, which is of rigid construction, serves as a mounting-chassis for the engine.

Whereas the Bullard Multi-Au-Matic Method is only one of the numerous phases of Trojan, Ltd. manufacturing processes, it speaks well for Bullard that Multi-Au-Matic was selected for one of the more accurate and important jobs.

Machining mating Faces and registers on the Crankcase Castings



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United's
Air Cleaner Man

DEFENSE NEEDS

PRODUCTS of all three United Specialties plants — Chicago, Philadelphia, Birmingham — are in increasingly urgent demand for application on units needed for defense requirements.

United Specialties Company manufactures an extensive range of over 260 oil bath air cleaner models for every type and size of internal combustion engine — plus ignition switches, turn signal switches, rolled shapes and television shells.

UNITED SPECIALTIES COMPANY
Chicago 28 • Philadelphia 36 • Birmingham

scription of any defect is written on the test form.

Shift patterns of the transmission are then checked for proper operation at various throttle settings and tail-shaft speeds. During the check, the action of the unit during shifts is carefully observed. Any noise not normal to a properly functioning unit is cause for rejection. When operating at high speeds, any excessive vibration or noise is also cause for rejection since rotating parts may be out of balance. Either excessive aeration of the oil or pump noise is a reason for rejection.

Testing done up to this point is not greatly affected by oil temperature, in fact oil returning from the unit is somewhat cooler than the original 180 F. This is due to the chilling of the oil by the relatively cold parts in the transmission.

Tests that follow, however, are very critical to temperature. The Merz testing equipment has to maintain an oil temperature so that oil draining back from the unit is not less than 170 F. In the subsequent tests, front pump pressures and torque at the tailshaft are checked to conform with Ford requirements.

A properly functioning transmission requires about five minutes to be thoroughly tested and each unit must undergo a complete test immediately before acceptance.

Thus with the fastening of a steel band to the converter housing to hold the torque converter assembly in place, the completed transmission is ready to be shipped to any one of the 19 Ford and Lincoln-Mercury assembly plants throughout the country.

PUBLICATIONS

(Continued from page 60)

D-77 Optical Straightedge

F. T. Griswold Mfg. Co.—Illustrated catalog 20 explains the principle of the optical straightedge.

D-78 Clutches

Twin Disc Clutch Co.—The cross country issue of the company publication "Production Road" gives many in-the-field applications of clutches and hydraulic drives.

D-79 Cutting Fluid

F. E. Anderson Oil Co.—Offered is a booklet describing Lusol an all-chemical cutting fluid.

D-80 Plastics

Rohm & Haas Co.—A new 66-page manual, the "Plexiglas Handbook for Aircraft Engineers" covers in detail the use of that acrylic plastic for transparent enclosures on aircraft.

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- Cuts clean, accurate discs up to 75" dia. in a matter of seconds.
- Turns smooth, high flanges on heads up to 73" dia. in a matter of seconds.
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- Minimum investment in machine and tools for hi-production of a vast size range of discs and heads.
- Fast set up for either circle shearing or flanging operation.

NIAGARA

Ideally adapted for either high or low and even single quantity production.

Effortless push button control with new automatic feeding cycle.

Variable Speed Power Flanging Feed lowers and raises upper flanging roll at optimum speed for ideal flanging. Operator can dial to proper feed rate to suit thickness of material.

Unbreakable steel construction throughout.

Write for Bulletin 86

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Manufacturers of America's Most Complete Line of Presets, Shears, Machines and Tools
for Plate and Sheet Metal Work

DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK

METALS

(Continued from page 56)

duty of 2½ cents per lb on lead until March 31, 1953, or the end of the emergency, whichever is earlier. However, it is not expected to have any perceptible effect on the lead price, as the bill provides that the duty shall be automatically restored if the price falls below 167½ cents per lb for 30 days. As the present ceiling price is 17 cents, there is not much leeway for a decline, even in the improbable event that for-

sign lead suddenly arrives in volume.

Yet in spite of the present scarcity of lead, with the entire supply allocated, there is a growing belief that supply and demand will be about in balance before long. Without much doubt a lot of scarce buying went on in the early months of this year and inventories are probably adequate in many lines. Recent official listings of metal shortages by Government agencies have generally omitted lead. European prices for lead have weakened and premiums have all but disappeared abroad.

More significant are the figures for shipment of battery replacements, the

most important sales outlet for lead which accounts for 30 per cent of its total consumption. Two months ago the Battery Manufacturers Association forecast a 1951 shortage of 9 million batteries. That alarming prophecy now appears likely to be tossed out of the window for sales in June dropped 20 per cent below those of June, 1950. Confirming the belief that batteries are in plentiful supply was the action of the Standard Oil Company of Ohio in reducing the price of its Atlas batteries 17 per cent in the height of the motoring season.

High Demand For Zinc

Zinc continues to be in high demand although it is almost inevitable that reduced automobile output will cut demand for high purity zinc for die-casting and to that extent make more metal available for other industrial uses. Stocks of slab zinc held by producers on July 1 totalled less than 16,000 tons, less than a week's supply at current shipment rates. Production shows no change from the average monthly rate maintained since January. Imports of zinc from abroad, including zinc in concentrates and ore, show no increase over the monthly rate of 1950 and the same can be said for domestic mine output.

In short, zinc is scarce but the trade is not alarmed. A director of one of the principal zinc mining and smelting companies stated in a recent letter to the author that he expected consumers would be able to satisfy their normal requirements during the rest of the year without undue difficulty. However, it appears significant that the largest deal ever consummated in the zinc industry for purchase of foreign zinc ore was recently made with an important Canadian mine on the basis of 17½ cent zinc with an escalator clause, if production costs increased. The contract was for some 180 million pounds of zinc deliverable over the next 2½ years, which suggests that there is no fear in top management circles of any collapse in the zinc price regardless of the outcome in Korea.

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Since 1910, Leece-Neville has been known as the pioneer and leader in design and manufacture of high quality, heavy-duty automotive electrical equipment. You can specify Leece-Neville with complete confidence that you will get the ultimate in performance and durability.



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Include dry-plate rectifier. Capacities from 50 to 175 amper for 6, 12, 24, 32 volt systems.



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60 to 2100 watts. Types available for all requirements.

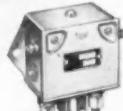
L-N CRANKING MOTORS

Heavy-duty construction for quick, dependable starting. ½ HP to 27 HP.



L-N REGULATORS

Patented, double-contact, long-life design, hold voltages to close limits.



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Hand and magnetic for standard and series-parallel systems.



L-N FRACTIONAL HP MOTORS

Standard production includes up to 1½" stack, for 6 or 12 volts. Other designs and voltages available.



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Aluminum Foil Used in Vehicle Processing

The transportation branch of the U. S. Army reports that the use of aluminum foil and ventilators in the processing of outbound vehicles at the Seattle Port of Embarkation is eliminating free water, condensation, rust, and corrosion, from vehicle interiors.

Though the use of aluminum foil requires more man hours in application, this method eliminates the need for constant inspections and reprocessing necessary with the previous method which utilized tape, shellac, and sealing compound.

To prevent condensation in the sealed vehicles, a ventilator is installed to allow air to circulate freely.

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with a BAIRD automatic CHUCKER

MACHINING A CAST IRON
OIL PUMP BODY



1ST OPERATION: Face flange, finish counterbore I.D. and depth, cut groove in flange, drill and tap $5 \frac{3}{4}''$ holes. Work held stationary for drilling and tapping . . . OTHERWISE WORK ROTATES. Production: 308 pieces per hour.



2ND OPERATION: Face and turn shank end, undercut spot drill and drill center hole thru to cored section, turn O.D. of shank, ream center hole, drill $2 \frac{1}{2}''$ holes. Production: 222 pieces per hour.

FULL DETAILS AND BULLETIN ON REQUEST

the BAIRD MACHINE COMPANY
STRATFORD • CONNECTICUT

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MACHINES • AUTOMATIC PRESSES • TUBING BARRELS

Supersonic Rocket Missiles

(Continued from page 37)

frequency and amplitude of these oscillations, and the way in which they either damp out or diverge, that determines whether the model is stable or not and to what degree.

Flutter characteristics can be obtained with these model tests. The swept wing is fitted with strain gages, the variation in resistance of which is fed into a telemeter channel and recorded on the ground. Such a test gives a plot of the bending and torsional oscillations of the wing against Mach number. These plots usually stop suddenly, indicating that the model wing has fluttered itself to pieces in only a fraction of a second.

The performance of various types of supersonic air inlets is measured by a programmed butterfly valve inside the inlet. Air is admitted for a fraction of a second, the inlet is closed and the air inflow ceases; followed by an opening of the inlet and a renewal of the flow. Accelerometers record the change in acceleration of the model against this program of air inlet, providing a reading of the variation of model drag with air inlet, the pressure recovery of the inlet obtained by static pressure reading inside the inlet, and any effects of the inlet on model stability.

During the past six years 1500 models have been tossed far out into the Atlantic Ocean from the NACA pilotless Aircraft Research Station on Wallops Island but thanks to this merciless treatment of skillfully-shaped models countless millions of dollars, human lives and years of time have been saved in America's rapid race to supersonic Air Power.

Electrostatic Atomization

(Continued from page 54)

increase of 60 per cent in sq ft per gal and a 60 per cent increase in productivity over the former hand spray method.

According to Ransburg, the new system is readily adaptable for automotive requirements and will handle with facility such parts as steering wheels, shock absorber bodies, fenders, hoods, trunk lids, doors, panels, etc. Too, the process can lend itself to the painting of complete bodies as well.

Of news interest is the fact that a number of automotive producers now are using the available No. 1 Ransburg equipment for applying clear lacquer on plated parts such as moldings, windows reveals, etc., as a protective coating.

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American Methods at Renault

(Continued from page 33)

without restraint. This has made it possible for Renault to use aluminum for cylinder blocks, cylinder heads, intake manifolds, and other parts.

The cast iron foundry is a beehive of activity and the workers appear to have an appreciation of real productivity. The foundry is modern in every respect and is completely mechanized, with mechanical molding, core blowing, and merry-go-round pouring lines.

One department in the foundry is equipped for making small cylinder sleeves by centrifugal casting. For this purpose they have a large indexing table on which are mounted six fixtures, each one handling three sleeves at a time.

Crankshafts are made of semi-steel castings in this foundry, metal quality being promoted by the use of electric furnaces for duplexing.

Chemical and metallurgical laboratory facilities are representative of the latest and best known equipment and instrumentation thanks to the close co-operation between the head of the department and automotive plants in the USA. Among other things they have a spectrographic section featuring the latest type of automatic charting machine; X-ray diffraction equipment; and a department set up for studies in photoelasticity.

In addition to the fundamental and routine research studies scheduled through the laboratories, a considerable volume of commercial research is undertaken to further developments which, in the USA, are handled by suppliers. For example, they have devoted considerable attention to the composition and sintering of cemented-carbides and have made arrangements for the manufacture of these tool materials for use in the machine shops. Another project of this character is found in their study of investment casting techniques. Experimental production already is established for producing valve guide bushings and valve seat inserts by investment casting.

Too, the laboratory is engaged in making by investment casting some experimental milling cutters of high-speed-steel alloys. Produced very close to size, these cutters require little machining except for grinding the cutting edges.

In the engine department considerable attention is devoted to quality and long schedule testing to assure freedom from service trouble. One pointed example is the block testing of a flat Diesel engine of some 105 hp which is built for use in buses and 5-ton trucks. Before acceptance these engines are subjected to a test schedule running 12 hours.

Rust Preventive Compound

Petrobase 210, a synthetic rust preventive composition for petroleum oils, petrolatums and waxes, is a recent development of Pennsylvania Refining Co., Butler, Pa.

Due to its polar activity Petrobase 210, used in small quantities, causes oils and waxes to displace preferentially water from metal surfaces. This property also prevents redeposition of aqueous vapors or liquids on the metal surface. The physical chemical mechanism controlling this displacement and repulsion of water provides protection against the most common causes of rusting, according to the manufacturer.

Among other characteristics, Petrobase 210 offers humidity protection, acidic emulsion or solution displacement and salt water immersion and spray protection.

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Valuable information for YOU...

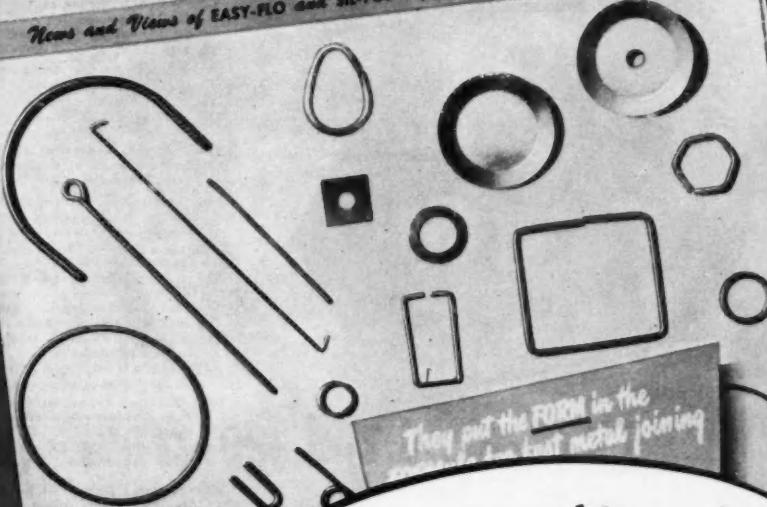
LOW TEMPERATURE BRAZING

Issued by Handy & Harman
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news

No. 54

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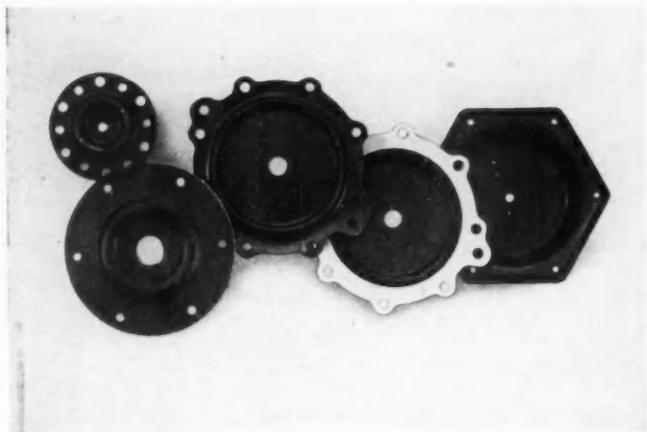


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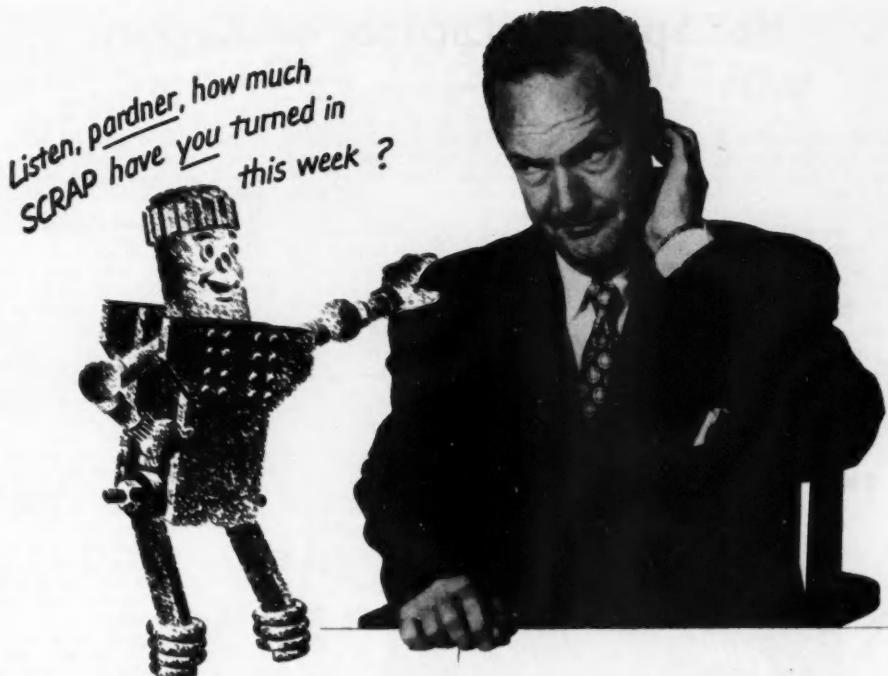


Address all communications to 754 Belleville Ave., New Bedford, Mass.

CALENDAR

OF COMING SHOWS AND MEETINGS

- First European Machine Tool Exhibition, Paris Sept. 1-10
 - Berlin Automobile Show, Berlin, Germany Sept. 6-16
 - SAE Tractor and Production Forum, Milwaukee, Wis. Sept. 10-13
 - Sixth National Instrument Conference and Exhibit, Houston, Texas Sept. 10-14
 - Second Conference on Industrial Experimentation, Dept. of Industrial Engineering, Columbia University Sept. 17-21
 - American Society of Mechanical Engineers (fall meeting) Minneapolis, Minn. Sept. 25-28
 - Nat'l Metal Trades Assn., Chicago, Ill. Sept. 26-28
 - Sixth Annual Industrial Packaging and Materials Handling Exposition, Cleveland, Ohio Oct. 1-4
 - SAE National Aeronautic, Production Forum, and Display, Biltmore Hotel, Los Angeles, Calif. Oct. 3-6
 - Paris Automobile Show, Paris, France Oct. 4-14
 - 36th International Motor Exhibition, London, England Oct. 17-27
 - National Metal Congress and Exposition, Detroit, Mich. Oct. 18-19
 - ASTE South Central Conference, Evansville, Ind. Oct. 19-20
 - SAE National Diesel Engine Meeting, Drake Hotel, Chicago, Ill. Oct. 29-30
 - SAE National Transportation Meeting, Knickerbocker Hotel, Chicago, Ill. Oct. 29-31
 - AGMA Semi-Annual Meeting, Edgewater Beach Hotel, Chicago, Ill. Oct. 29-31
 - SAE National Fuels and Lubricants Meeting, Drake Hotel, Chicago, Ill. Oct. 31-Nov. 1
 - American Petroleum Institute (31st Annual Meeting), Chicago, Ill. Nov. 5-8
 - American Society of Mechanical Engineers (annual meeting), Nov. 25-30
 - Ninth Annual Pittsburgh Diffraction Conference Nov. 29-30
 - Motor and Equipment Wholesalers Ass'n (Annual Convention) Chicago, Ill. Dec. 5, 6, 7
- 1952
- Brussels Automobile & Truck Show, Brussels, Belgium January
 - Plant Maintenance Show, Phila., Pa. Jan. 14-17
 - SAE Annual Meeting, Detroit, Mich. Jan. 14-18
 - Society of Plastics Engineers, Inc. (eighth annual technical conference), Chicago, Ill. Jan. 16-18
 - National Transport Vehicle Show & Fleet Maintenance Exposition, New York Feb. 26-28
 - Pacific Automotive Show, Los Angeles, Calif. Feb. 28-Mar. 2
 - Fifth National Plastics Exposition, Phila., Pa. Mar. 11-14
 - Geneva Automobile & Truck Show, Geneva, Switzerland Mar. 20-30
 - American Society of Lubrication Engineers, Seventh Annual Meeting and Lubrication Show Cleveland, Ohio Apr. 7, 8, 9
 - Western Highway Institute, Palm Springs, Calif. Apr. 17-19
 - API Div. of Refining, San Francisco, Calif. May 12-15
 - American Society for Testing Materials (annual meeting) New York City June 23-27



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SUPPOSE that every steel user were suddenly told that he had to turn in half-ton of scrap before he could get a ton of steel. It would start the most gosh-almighty treasure hunt for scrap that ever happened.

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cannot be met unless at least 100,000 tons of "purched" scrap roll into the furnaces—*every day*.

The bulk of this scrap must come from industry. That's why we're asking for your all-out help. That's why it's so important that you make the drive for scrap part of your daily operations. Make it your business to encourage every employee to report any obsolete, broken or worn-out machinery, tool or equipment that has seen its day. From this dormant "junk" must come the heavy melting scrap that the mills need most. Don't let your scrap lie idle; send it on its way. How about it, pardner?

You'll find your local scrap dealers listed in the yellow pages of the phone directory.



1-1326

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UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Hot Spraying Lacquer on Aircraft

(Continued from page 43)

Blushing is eliminated. In areas having high humidity blushing is a major problem. Moisture condenses on freshly sprayed lacquer as it is cooled by the rapid evaporation of solvents. This condensation causes the film to become cloudy. When lacquer is sprayed hot it is almost impossible to produce blushing.

The hot applied film is more uniform.

By hot spraying the lacquer is always applied at the same temperature and is much less contingent upon booth or atmospheric temperatures. There is less film shrinkage from solvent evaporation. By eliminating sanding between coats, a full film is obtained over rivets, screws and other areas which are often sanded too much.

The hot sprayed film has a smoother,

glossier, fuller appearance. Its full luster can be brought out by dry buffing or at most, just a minimum of polishing.

Reduced Hazards

Health hazards are reduced in two ways. First, by using heat instead of thinners to lower the viscosity, less solvents are used and, obviously, fewer solvent fumes are thrown off during the spraying and drying operations. Since these solvents have toxic characteristics, precautions must be taken to prevent breathing fume laden air. Inhalation of these fumes may cause temporary harmful and annoying effects. Secondly, hot spraying decreases the amount of spray fog which may rebound into the operator's face. This is particularly beneficial when spraying in areas where adequate ventilation is not available.

Smaller amounts of solvents used mean less flammable vapors to be exhausted. Hot spraying requires less thinning and reduces fire hazards.

All work on hot spraying at Douglas Aircraft Co., El Segundo, has been done with Specification AER 52-L-26, Amendment I, glossy sea blue lacquer using only specification thinners. This material is not tailor made for hot spray application. It is the same lacquer that is used in cold spray applications. Using the same materials for both methods of application simplifies storage and handling problems. Lacquer may be purchased from the manufacturers thinned to hot spray viscosities. This thinned material has good package stability and eliminates possible errors in thinning ratios and contamination by additional handling. The spray viscosity lacquer can be thinned for cold application or touch-up work. This lessens the hazards of storing and handling highly flammable thinners as well as decreasing the man hours and equipment needed for thinning.

A tailor made finish material, no doubt, would give even better results. How much improvement may be expected will depend upon the paint formulators. Any change will have to be justified by complete testing. Also, improvements will come as spraymen familiarize themselves with the small changes in technique required by the hot spray method.

In summation it may be said, briefly, that use of the hot spray method of application saves man hours and booth time; it saves critical materials such as thinners, pigment and resin; it produces a better film by greater uniformity, less porosity, and decreased running, sagging and blushing; it decreases health and fire hazards; it saves on storage and handling.

THE RIGHT BALL



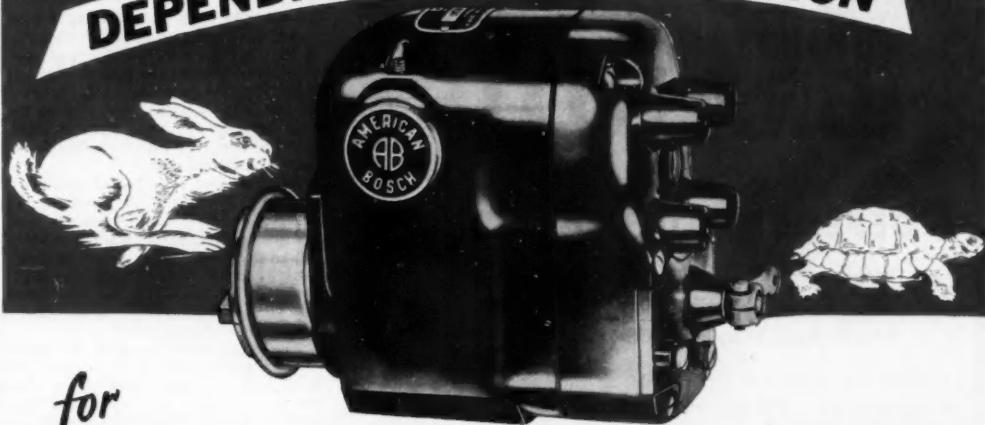
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Strom has been making precision metal balls for over 25 years for all industry and can be a big help to you in selecting the right ball for any of your requirements. In size and spherical accuracy, perfection of surface, uniformity, and dependable physical quality, there's not a better ball made.

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DEPENDABLE SPARK IGNITION



for

FLASHING SPEED or SUSTAINED SERVICE AMERICAN BOSCH MAGNETOS

Wherever dependable spark ignition is needed—for flashing speed in the air or on the speedway—for rugged sustained operation in oil field, construction or farm service, you'll naturally find American Bosch Super-Powered Magnetos on the job. These world-famous magnetos deliver the faultless spark ignition and unerring reliability your customers look for in your equipment. Because they stand up under the heaviest loads and give long, economical work-life, regardless

of the type or severity of service, many leading engine builders choose American Bosch Magnetos as original equipment.

Whatever your magneto requirements may be, American Bosch can provide the practical answer for outstanding ignition service. American Bosch Super-Powered Magnetos are available in various types and sizes for engines large and small—special low-tension models for large stationary gas engines. Ask us for the facts today.



Said Lee Wallard, the winner of this year's big "500" Indianapolis Speedway Race . . . "Sure happy I won today's 500 mile classic. The American Bosch M.J. Magneto on my Belanger Special never missed a beat all the way. It's a champ."



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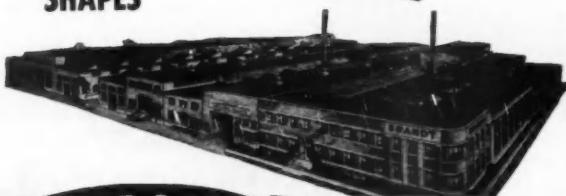
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Michigan Tool

(Continued from page 50)

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Rate of feed is adjusted (infinitely variable) by setting the dials on two valves; one for the plunge-cut feed, one for traverse feed. Fine pitch screw adjustments on large screws provide settings of hob spindle angle and depth of cut (for plough feed). The latter adjustment is through a handwheel with a micrometer dial.

The machine is designed to handle any helical or spur gear or spline up to eight in. diameter and 4½ in. face width. Coarsest pitch recommended is three. Either climb or conventional hobbing can be used, as desired.

Among interesting details is the oil-air-mist lubrication. Controlled by a solenoid, this lubricator works only while the machine is in operation. It provides effective continuous lubrication, while running, although oil consumption is only two oz in eight hours. The rotating gears pick the oil from the air-mist.

Despite its massiveness—the new gear hobber weighs 21,000 lb—it is remarkably compact, requiring only 84 by 84 in. floor space. Overall height, including hob-shifter is about eight ft.

BUICK

(Continued from page 49)

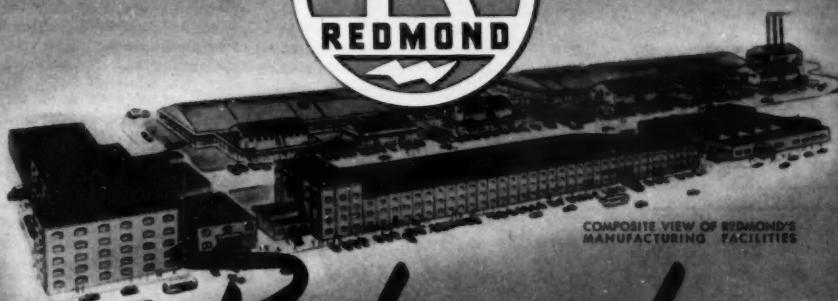
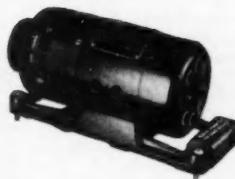
is required only for high outputs; consequently, the methanol carburetor comes into action only after the gasoline carburetor throttle reaches a nearly wide-open position. Two separate fuel tanks and electric fuel pumps supply the carburetors. Stainless steel exhaust manifolds of the collector type are used.

The engine was designed for high output at speeds considerably below those ordinarily attained in highly supercharged racing engines, and the valve sizes, ports and cams were developed with this objective in mind.

Le Sabre was described and illustrated in AUTOMOTIVE INDUSTRIES Jan. 1 and August 1, 1951.

PROPERTIES OF LUBRICATING OILS AND ENGINE DEPOSITS, by C. A. Bowman, published by The Macmillan Co., 69 Fifth Avenue, New York 11, N. Y. Price \$3.00. In this book—translated from the Dutch—the author deals briefly but authoritatively with the principles and problems underlying the lubrication and fouling of internal combustion engines. It includes many charts and tables.

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THE BIG NAME IN SMALL MOTORS

National Air Races

(Continued from page 41)

performance of a formation of four Sabres which raced from Chicago to Detroit in slightly under 21 minutes to cover the 237 miles at a speed of 672.189 mph, or slightly better than the Sabre-held world's record of 670.981 mph set three years ago.

It is becoming clear that the technical progress of aircraft airframes and engines have overtaken the purpose and limitations of the National Air Races and transformed them from their historic role as literal "races" into a mere air "show" or display of military aircraft. Lying at the heart of this transformation is the fact that airplane speeds simply can no longer be confined to a closed course around pylons on the ground. Col. Ascani established the new 100-km mark around a course made up of six pylons and he was required to keep his airplane no higher than 2000 ft. He flew the course at about 1200 ft, but his path was a smooth circle around the circular course and not the breath-taking pylon turns that have characterized the races for so many years.

Col. Ascani's lone speed dashes around the course, spectacular though they were to the huge crowd, com-

prised all that remains of the historic Thompson Trophy Race, which established the high-water mark in independent aircraft design and transformed such names as Roscoe Turner, Jimmie Doolittle, Jimmie Wedell and so many others into symbols among aviation fans prior to World War II. After the war, however, original design in the high-powered field was crushed by the combat airplane and the Thompson became a race for North American P-51 Mustang, Lockheed P-38 and Bell P-39 surplus fighters bought for a song by their civilian pilots, and their engines souped up to life expectancies measured in hours. Speeds moved past 400 mph around the pylons and the tragic death of William P. Odom in the 1949 Thompson race, in which his airplane crashed through a house nearby taking the lives of adults and a child, signalled the end of an era.

The pilots themselves saw the inevitable long before the race management and formed their own Professional Race Pilots Association, which established rules and regulations for the design and piloting of racing airplanes. The Continental Motors Trophy Race, now in its fifth year, is a product of

this new theory of "controlled" competition and the event has not suffered a casualty to date, attesting to the foresight of the pilots. Built in garages and basements, the airplanes in this feature must be powered by engines of 190 cu in or less, have a wing area of not less than 66 sq ft, and must weigh at least 500 lb. The pilots may not fly at an altitude of less than 50 ft around the 2½-mile course. Each airplane must pass a rigorous inspection by a technical committee, including a complete stress analysis, and the pilot's ability to handle the airplane in the race must be demonstrated in a performance before the group.

The name "backyard racer" is an apt one when applied to the vast majority of the two dozen airplanes assembled for the various heats of the race. Their designer-pilots obviously sacrifice the thousands of hours demanded by their design and construction in exchange for the thrill of appearing in the race—but they have no hope for any of the prize money. Inefficient airfoils; square, wavy fuselages and wings, and sharp-angled empennages attest to their near-total lack of aerodynamic information. The same small group wins the prize money year after year while all of the others stubbornly continue to work all year in exchange for two days of racing in top-flight competition.

The Continental Motors Trophy Race

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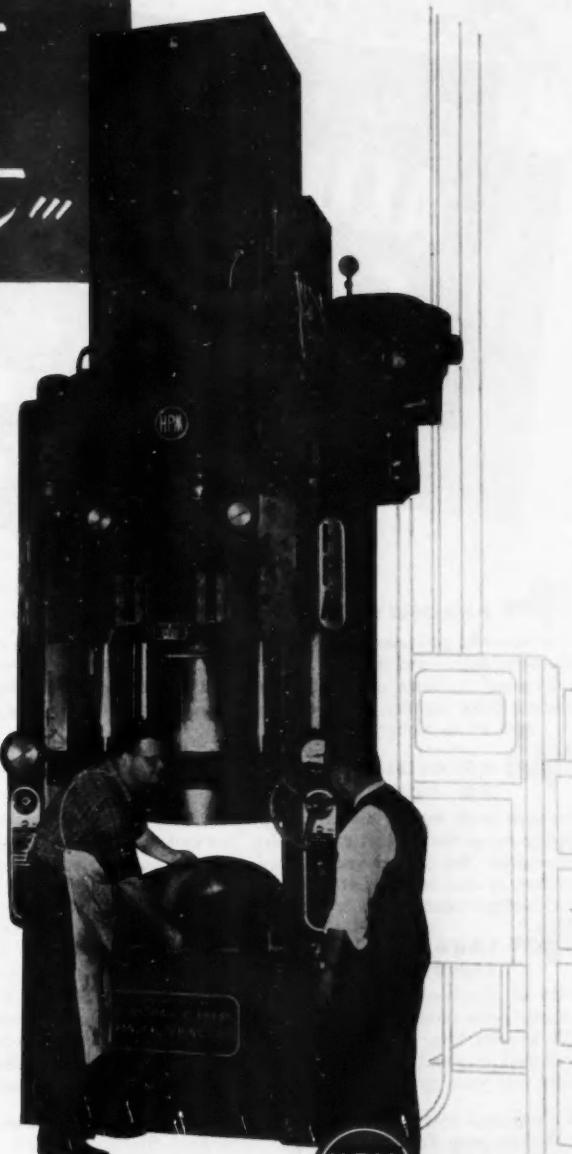
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AIR RACES

(Continued from page 110)

winners are divided into two groups: one group is made up of S. J. "Steve" Wittman, 41-year-old fixed base operator in Oshkosh, Wisc., who now has the distinction of being the only pilot to have competed in every National Air Races since 1928. Steve, and his protege, William Brennan, represent the rote of experience in the design and construction of racing airplanes and, without formal engineering education, he has consistently brought a winning airplane to the races through the sheer weight of his long and successful career in the field.

The other group in the winning circle invariably comes from a cluster of builders in the San Fernando Valley, Los Angeles, Calif., which draws on the gigantic technical knowledge of engineers at Lockheed Aircraft Corp. located in the valley. This group represents the omnipotent power of scientific knowledge in the production of a fast airplane and it is this absorbing battle between this group and the experienced Wittman group that represents the contest in this field.

This annual battle of experience-vs-science was a clear draw this year with science taking first and third places, experience second and fourth places. Most importantly, however, was the fact that new speed records were established this year in the event, a product of the continuing effort towards drag clean-up. In the pre-race qualifying trials, when all entrants must demonstrate a speed of at least 140 mph, John Paul Jones of Van Nuys, Calif., established an all-time record speed of 199.778 mph, which, on a mere 85 hp, attests to the skill of these midget racer designers. (Personal aircraft with the same engine do only 120 mph, the North American T-6 standard trainer requires 600 hp to do 200 mph). Wittman qualified second to Jones with 193.340 mph. Although qualifying speeds are usually well above race speeds, this year the race performances were right on the qualifying pace with Jones averaging 197.218 mph and Wittman 192.174 mph. The Continental Motors Trophy Race is staged in a series of heats; three elimination races the first day produce first and second-place winners, all six of which go directly into the final race the second day. A consolation race the second day accommodates the first day's losers. Total purse of \$25,000 is divided six different ways in each of the elimination races and the final race winner receives \$2700. By winning the \$1500 first-place money in his elimination race, the winner takes home \$4200, which may permit him to just about break even on the effort. Costs of the midget racers varies from \$3000-\$5000 to \$8000 for the fanciest all-metal design.

(Turn to page 114, please)

IT TELLS
HOW TO DO THE
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Better cleaning cuts costs in aircraft production. This 48-page illustrated booklet outlines all the big cleaning jobs. Have you seen the latest Oakite recommendations on:

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See pages 10 to 14.
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- || How to clean aluminum before and after heat treating? See page 20.
- || How to strip paint from aluminum? See page 22.
- || How to clean magnesium? See page 27.
- || How to select and install cleaning tanks, rinse tanks and sprays, and spray-washing machines? See pages 31 to 35.
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MOLY

AIR RACES

(Continued from page 112)

In the classic Bendix cross-country event, which has also seen the demise of privately-owned racing planes, a mixed bag of jet aircraft was featured including not only the Sabre but the Republic F-84E fighter and the big North American B-45C tour-jet bomber. Two of each type aircraft competed and all were given the option of flying non-stop, making refueling stops en route or using aerial refueling, although none chose the last method due to the necessity for slowing down to the pace of the refueling plane for a period of up to 10 min, including pre-contact maneuvering. The Sabre fighters stopped at Denver, Colo., and Omaha, Nebr., for fuel, attesting to their one-hour endurance at top speed. The Sabre piloted by Capt. T. S. Gibson ran short of fuel on the last leg and came in at Selfridge Air Force Base, Mount Clemens, Mich.

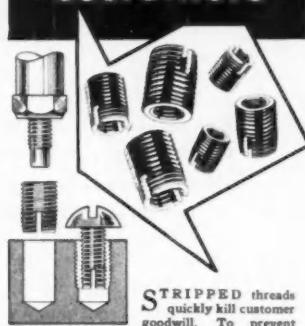
The fuel stops for the Sabres were carefully rehearsed and executed with precision with some 450 gal being transferred at an elapsed time for the entire stop from wheels down to wheels up of only four minutes.

The Thunderjets equipped with external fuel tanks made the 1919.5-mile trip non-stop and came across the finish line only eight min after the speedier Sabres. An interesting comparison between the modern jet fighter and jet bomber was available in the fact that the big 40-ton B-45 Tornado bombers made the trip only seconds slower than the fighters, proving that modern bomber design, through the medium of the turbojet engine, has closed the historic gap between the speeds of the two types. Although cross-country racing introduces the factor of head and tail winds, the speeds posted in the Bendix event were obviously well below the capabilities of the Sabres. The winner, Col. Keith K. Compton, however, revealed that he passed over Chicago at about 40,000 ft and went into a long dive for the Detroit Wayne-Majors Airport holding his plane at precisely sonic speed until he passed over the finish line. At one point he reported a speed of 800 mph with tailwind, an astonishing evidence of today's combat aircraft performance.

The frightening, erratic noise of the afterburner, familiar to the engineer, was introduced to the public for the first time with demonstrations of the Lockheed F-94B, Northrop F-89B and the heretofore secret McDonnell F2H-2NP with afterburner. The Northrop demonstrated its sonic speed capabilities in speed dashes across the field with the brilliant, blinding flashes of shock waves clearly seen across its wings. The ear-shattering thunder of the F2H Banshee was heard as it raced down the runway in a climb demonstration during which it reached

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Man-hours
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U. S. Patent 2,455,085
STRIPPED threads quickly kill customer goodwill. To prevent tapped thread failure in light metals, plastics,

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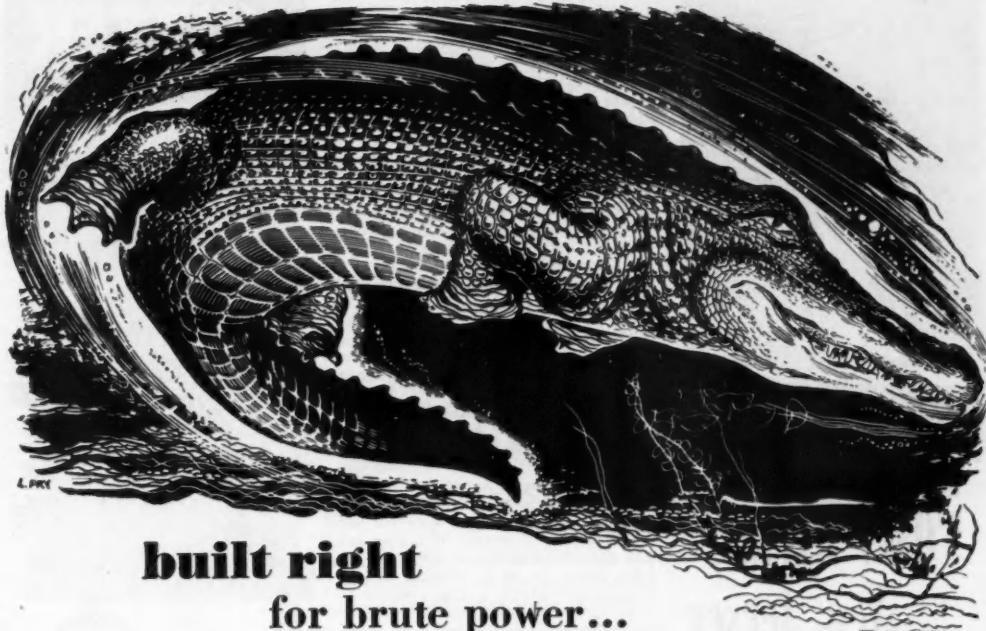
Send for samples and descriptive folder.

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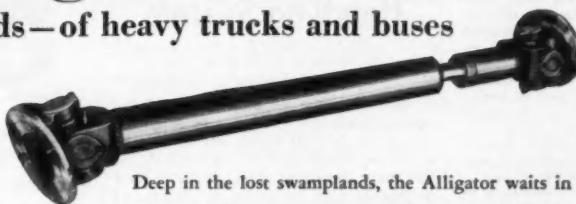
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AIR RACES

(Continued from page 114)

40,000 ft in only seven min, 20 sec.!

The static display at the 1951 National Air Races was one of the most daring revelations of military secrets yet laid bare to the public. Available for intimate inspection by 165,000 civilians and the Air Attachés of 40 foreign nations were such heretofore secret aircraft as the Douglas F2D-1, Vought F7U Cutlass, Martin P4M Mercator, anti-submarine warfare version of the Douglas AD Skyraider and the Northrop F-89 Scorpion plus the more familiar Convair B-36, Douglas C-124, Boeing B-50, Republic F-84 and many others. Most interest seemed to be attached to the cavernous mouth of the Douglas C-124 Globemaster II with lines of spectators passing up the ramp and through the spacious interior.

These things all point to a clearly changing character of the National Air Races with only a handful of midget racing planes carrying on the historic original design nature of the event but the thunder and screech of the jet engine absorbing all of the glory for itself. There can be no criticism of this evolution for if the annual event is to comprise a progress report on aviation, it can do no more than to display the latest and best of our combat airplanes. And the 1951 National Air Races at Detroit assuredly did that—and more.

Handling System

(Continued from page 64)

forced with steel—is laid on top of the opened crate. This cover is hooked onto the steel channel which serves as the hinge or "backbone" of the book. Then the rack, together with the cover and backbone, and the crate of sheets, is turned over by the overhead crane. The rack is then lifted off, the rest of the shipping crate removed, and the second cover laid in place and attached to the backbone. Now the book is complete and ready to be transferred to its proper place in the vertical storage rack, of welded steel members, until the sheets are needed.

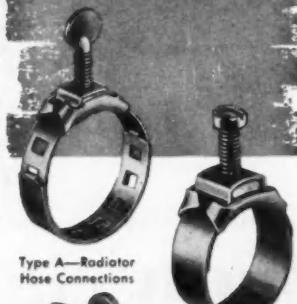
Finding a supply of sheets when desired is a simple task. Test samples can easily be taken of a particular grade of stock: The book is merely lifted from the storage rack and placed in a "V"-rack. The sides of the "V" are at an angle of 70 deg, so that the covers open out and the desired specimen can be removed.

When the factory calls for a supply of the stock, the entire book can be carried to the shears or presses, the needed material removed, and the remaining sheets carried back to the library, still in their covers.

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NOC-OUT HOSE CLAMPS

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Parker Products meet
 government specifications

Available for your guidance—a list of government finish specifications and the Parker Products which meet their requirements. Write for your copy.

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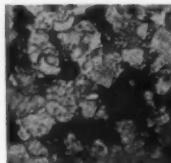
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How to select grain structures for better machinability of alloy steels



Blocky Ferrite, Low C



Spheroidized, Med. C



Lamellar, Med. C

The combination of grain structure, ductility and hardness has, in general, much to do with the degree of machinability of an alloy steel.

For purposes of comparing different types of machinability, all alloy steels may be grouped in three carbon ranges: low carbon, .08 to .30 pct; medium carbon, .30 to .50 pct; and high carbon of .50 to .80 pct.

Each of these ranges must be considered separately, as each has a pronounced effect on the corresponding grain structure and machining properties. Certain grain structures may be well suited for one type of machining and at the same time wholly unsuited for others. For example, in a medium carbon range, an alloy steel with a spheroidized structure may be good for turning operations, poor for forming, fair for drilling, and poor for broaching. This, of course, means that a compromise must usually be accepted to get the most economical overall machinability in any one grade of steel.

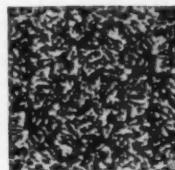
The table shown here is a suggested guide. It contains various combinations of carbon range, heat-treating process and structure believed to be most suitable for each type of machining.

Our metallurgists will gladly furnish further information on the relative machinability of various alloy grades. Call or write for this information.

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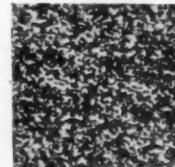
Sorbitic, Med. C



Spheroidized, High C



Lamellar, High C



Sorbitic, High C

CARBON RANGE	PROCESS	STRUCTURE	TURNING	FORMING	DRILLING	BROACHING
LOW (C .08 to .30)	Normalize or Anneal	Blocky Ferrite	Good	Good	Good	Good
MEDIUM (C .30 to .50)	Anneal	Spheroidized	Good	Poor	Fair	Poor
MEDIUM (C .30 to .50)	Anneal	Lamellar	Fair	Good	Good	Good
MEDIUM (C .30 to .50)	Heat Treat	Sorbitic	Fair	Fair	Fair	Fair
HIGH (C .50 to .80)	Anneal	Spheroidized	Good	Good	Good	Fair
HIGH (C .50 to .80)	Anneal	Lamellar	Fair	Poor	Poor	Poor
HIGH (C .50 to .80)	Heat Treat	Sorbitic	Good	Fair	Good	Good

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*... to Provide
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Supplementing Allied's extensive die shop facilities is a modern, completely-equipped foundry for precision-cast zinc alloy dies. Here, thoroughly skilled and experienced personnel produce dies for experimental parts and short run production . . . quickly, accurately and economically.

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PLANT 1
Detroit, Mich.



PLANT 2
Detroit, Mich.



PLANT 3
Hillsdale, Mich.



PLANT 4
Hillsdale, Mich.

production costs slashed 57% by new CLEVELAND PRESS



Photo courtesy of Superior Separator Company, Hopkins, Minn.

FARMHAND oil tanks, originally designed for wrap-around hand-welded production, are now drawn on a Cleveland Press and seam welded. This has resulted in spectacular savings of 57%.

Here's what Alan R. Moe, Factory Manager of Superior Separator Company, says: "Because of the extreme stability of our Cleveland Press, we found we could exceed the recommended drawing rate of 55 feet per minute on this job. We operate our Cleveland at a fast 75 feet per minute *without any tearing*. Furthermore, the press has given us no trouble since it was delivered 18 months

ago. Quality of work turned out is unsurpassed."

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Whether they are to withstand dry desert heat and burning sunlight or the prolonged damp cold of arctic regions, these newly developed rubber stocks can be supplied in precision molded, extruded, die-cut, or lathe-cut shapes having varying degrees of hardness, tensile strength and elongation to meet the demands of specific applications.

STOCK NUMBER	Before Aging				After Aging (70°F , 60% RH)		
	DUROMETER HARDNESS Shore A Scale	TENSILE STRENGTH p.s.i.	ELONGATION per cent	LOW TEMP. TEST (-5 hr test)	DUROMETER HARDNESS Shore A Scale	TENSILE STRENGTH p.s.i.	ELONGATION per cent
408	40	2223	530	-70	135	1931	475
507	65	2415	360	-70	148	2544	325
516	38	2855	439	-70	160	2697	400
516	78	1546	230	-70	184	1706	215
720	60	2284	300	-50	*83	1953	225
822	65	2285	330	-50	*62	2239	423
823	80	2081	233	-50	*82	2046	175
847	50	1569	548	-50	*60	2060	328

A.S.T.M. D746-44T

Stocks listed above are only representative of the many compounds available.

In addition to weather resistance, these parts can have the capacity for withstanding other deteriorating forces such as abrasion, compression and chemical action. For applications involving extreme temperatures as low as -110° and as high as $+500^{\circ}$ Fahrenheit, parts can be fabricated from Silicone Rubber Compounds.

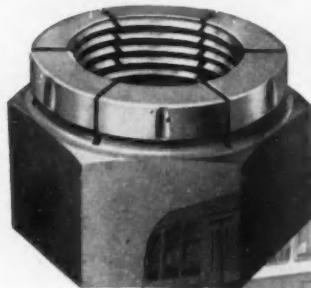
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FLEXLOC® SELF-LOCKING NUTS



PTC mechanic Bob Casey tightens Flexloc locknuts used on rear axle flange of PTC bus.

help PTC to "keep 'em rolling"!

Every day thousands of Philadelphians depend on Philadelphia Transportation Company buses. To "keep 'em rolling", PTC's maintenance must be constant and thorough, since minor failures often cause major breakdowns.

For example, the hex nuts on bus rear axle flanges were being loosened by vibration, despite periodic inspections. Sheared studs resulted. Replacements were expensive, disrupted schedules and loss of riders' goodwill even more so.

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"regular" type.



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Nut, "thin" type.



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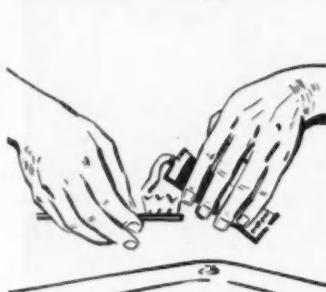
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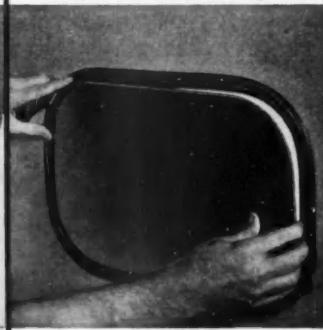
1. Set Inland Strip in body panel . . . simple as putting paste on brush.



2. Set glass in Inland Strip . . . simple as actually brushing teeth.



3. Zip filler strip into locking channel . . . simple as rinsing your mouth.

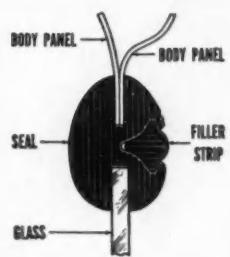


Three simple steps, and the job is done! Inland Self-Sealing Weather Strip goes into windshields and fixed windows with amazing speed and ease. It really *slashes cost* . . . because *one man* does the whole job, and in less time than it takes *two men* to do ordinary sealing.

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The seal goes into the body panel, the glass into the seal, and the filler strip into the locking channel. That's all . . . a fast, low-cost, one-man job . . . done once . . . for permanent weatherproofing!



Self-Sealing Weather Strip

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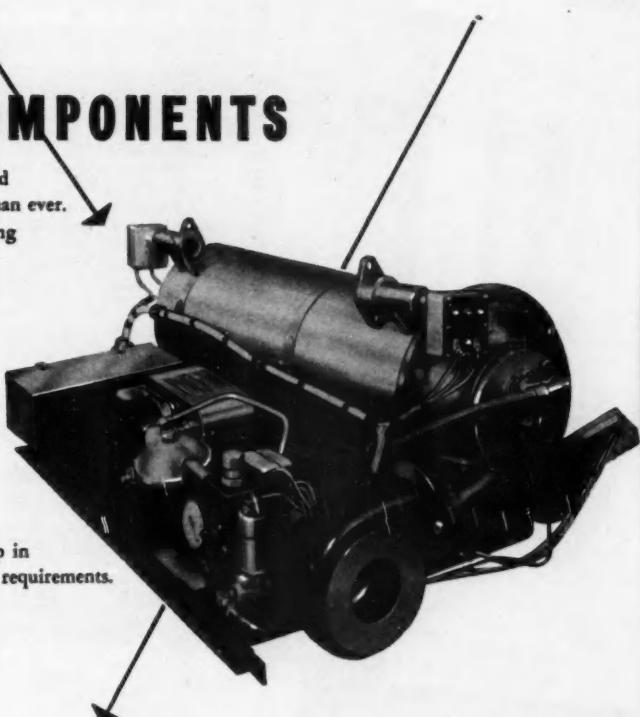
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General Motors Corp.
United States Air Force

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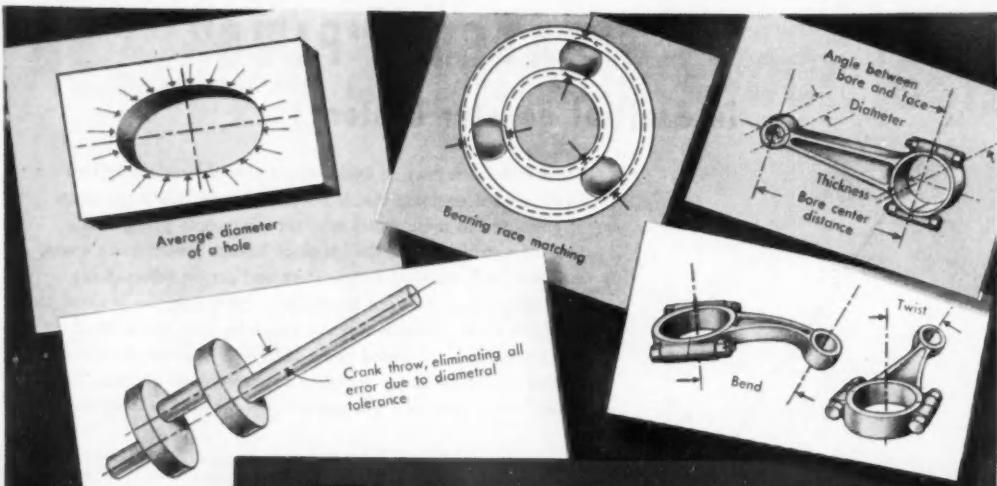
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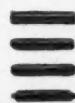


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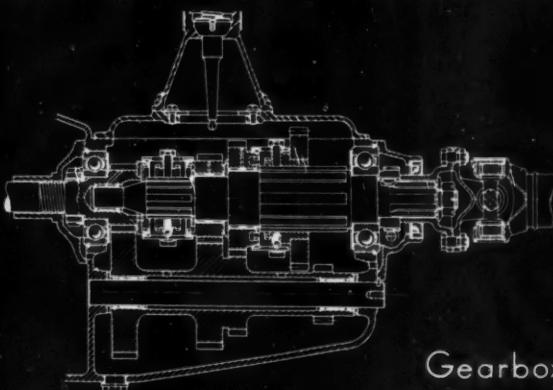
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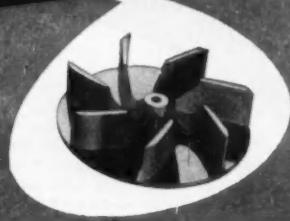
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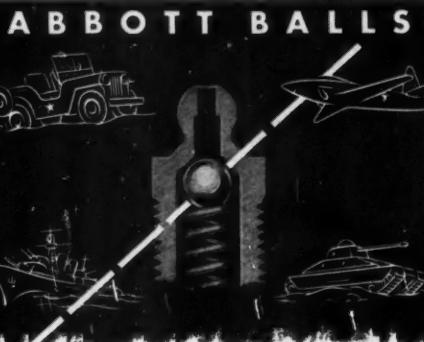
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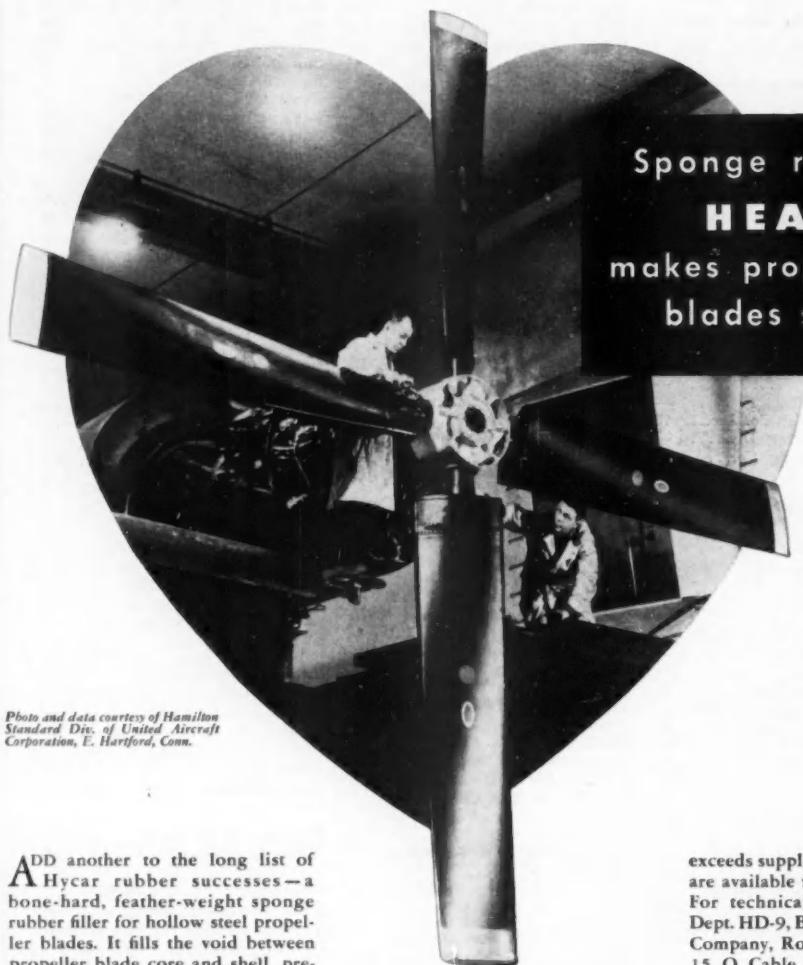


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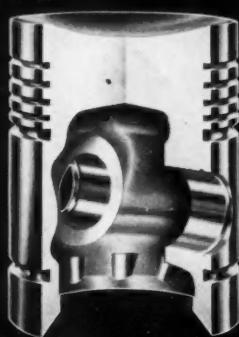
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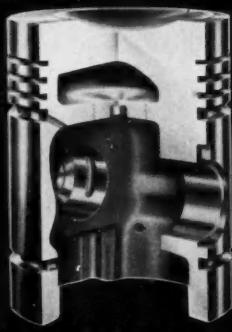
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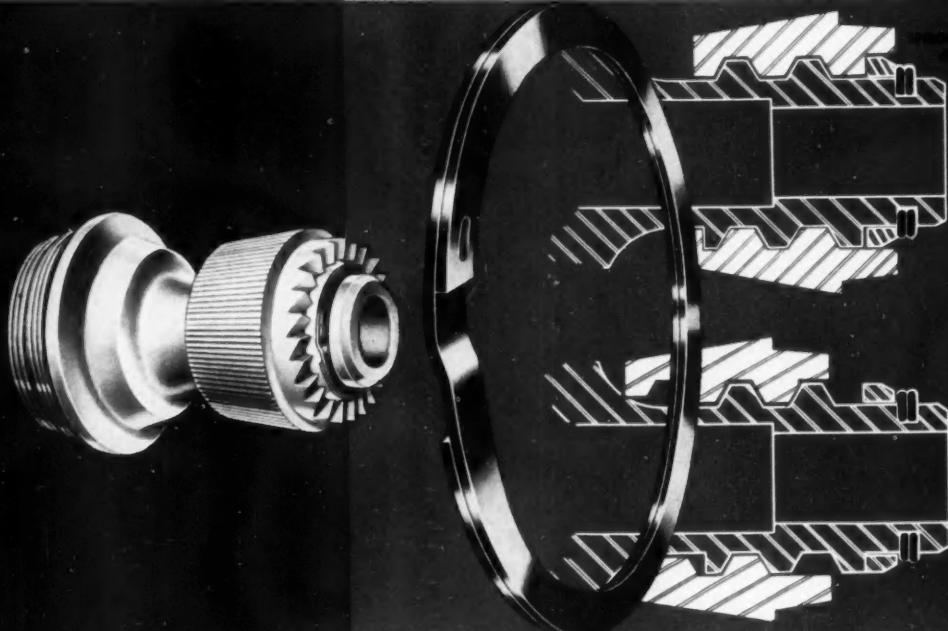
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